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TESIS DOCTORAL

MODELING OF DUAL LISTED CHINESE STOCKS
WEAK ARBITRAGE ENVIRONMENT

MEMORIA PARA OPTAR AL GRADO DE DOCTOR

PRESENTADA POR

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Modeling of Dual listed Chinese Stocks – Weak arbitrage environment

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Abstract

Given the rapid development of the Chinese economy over the last few decades the Chinese capital market has gained in importance. The Chinese capital market remains, compared to western standards, as a relatively closed one. For instance, foreign investors have limited access to this market (only through some pilot programs). Interestingly, there is a group of dual listed companies, listed both in mainland China (A-share) and Hong Kong (H-share). The Hong Kong stock market is an open one and foreign investors have very few restrictions on investments in securities listed there. Hence dual listed companies have the same two securities (theoretically identical) but with a completely different investor base. In the first part of this dissertation a study of the Chinese capital market is carried out, including pilot programs that allow foreign investors investing in mainland China (QFII and RQFII) as well as domestic investors investing overseas (QDII).

In the second part a quantitative analysis of the market is performed. Most of the analyses in this dissertation are performed at a company rather than at an index level in an attempt to gain more granular knowledge of the market. One of the first conclusions of this work is that Chinese stock returns seem not to be normally distributed. This result does not only apply to dual listed companies but to the broader A-share market. Another important result is that the returns of dual listed companies in the A-share and H-share market for a long period of time (12 months) seem to be statistically equal (for the period analyzed). Also, it is shown that contrary to popular believe, the assumption that the A-share (mainland China) market is more volatile that the H-share market for dual listed companies does not hold in general. For instance, for the period analyzed (12 moths roughly fitting with the 2011 calendar year) H-share dual listed stocks were overall more volatile than their A-share counterparties. The impact of market events, such as profit warnings, in dual listed companies was analyzed. One common preconception is that the A-share market reacts to a market event in a more volatile way, due to the large amount of retail investors, than the

A-share market. Through a case study in the shipbuilding sector it is shown that this is not always the case.

Another of the main results is that dual listed companies can be broadly divided into two types of companies, the large state-owned banks (and related companies) and the rest of corporations with dramatically different behaviors on their price spread (A-H spread). A Markov-switching model was utilized to quantify this behavior. This model shows that the large state-owned banks have one period with infinite duration, meaning that it would be very difficult for an investor to find an arbitrage opportunity in this type of company. Several cases studies analyzing in detail companies in sectors such as oil, banking, insurance, water conservation or aluminum are also presented.
The efficient frontiers for the two portfolios formed by the A-shares and the H-shares (dual listed companies) were calculated. The risk return profiles of these two portfolios (independently) are rather different. This is consistent with the idea that investors in the mainland market and the Hong Kong market behave in rather different ways.

It is also shown that given that the A-share and H-share of a dual listed company move in the same daily direction on average only in 65% of the cases finding trading opportunities could be difficult and would likely require considerable market knowledge. GARCH(P,Q) models were used to model the volatility of the stocks (A-share, H-share as well as the spreads) taking into consideration clustering effects (an ARCH test showed the existence of ARCH effects). The results shows that a that a GARCH(1,1) is not an inferior model to a GARCH(2,1) for most dual listed companies It will be also shown trough a case study (airlines) that it is not possible to conclude in general that comparable companies, such as China Southern Airlines and China Eastern Airlines, are necessarily best model by the same model (GARCH(1,1) or GARCH(2,1)).

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Chapters Overview

This thesis is composed of two main sections and 7 chapters. In the first section (chapter 1 to 3) an introduction of the Chinese capital market and analysis of its main qualitative characteristics focusing on dual listed Chinese stocks is presented. In the second section (Chapters 4 to 6) and in depth quantitative analysis of dual listed companies in China was performed.

In Chapter 1 there is an introduction to the Chinese Capital markets including the mainland China market and the Hong Kong market. While there is increasing integration between those two capital markets there are still very important differences. The main cross border pilot programs allowing foreign investors accessing the mainland china market and domestic (PRC) investors accessing overseas market will also be introduced. Also the major regulatory bodies in the securities sector were introduced. It is important to understand that while Hong Kong belongs to China they have fairly independent regulators in the securities space as well as in the overall economy, such as the Hong Kong Monetary Authority.

In Chapter 2 a brief introduction to Chinese demographics is performed. Given the high percentage of retail (individual) investors compared to other international markets (where institutional investors account for the bulk of the market) having a basic knowledge of the Chinese demographics seems to be necessary to have a complete picture of the Chinese stock market. A survey of Chinese nationals investors was also carried out. This survey seems to indicate that mainland China investors (regardless of age, gender or residency) seem not look at the performance of the H-share (dual listed companies) when trading A-shares. A review of corporate governance in Hong Kong and in the mainland is also carried out in this chapter. The issue of the difference in the regulatory systems of Hong Kong and the PRC was also analyzed in this section.

In Chapter 3 a detailed review of the trading rules applying to the mainland and Hong Kong market is performed. When analyzing the performance of dual listed companies it is important understanding that the Hong Kong mainland China stock markets have different rules and regulations that could potentially impact stock performance. For instance, the issue of short selling (allowed in the Hong Kong market and more restricted in the mainland market) is of clear relevance. Clearly other issues such as different trading hours, different holidays and unscheduled market closures (in one market but not the other) are likely to cause price differences between the stocks in Hong Kong market and the mainland markets. Another issue analyzed in this section is the different trading rules. For instance, a stock will be halted in the mainland markets if the price increases/decrease by 10% from the previous day closure level.

In Chapter 4 a quantitative analysis of the properties of Chinese stocks was performed, analyzing basic quantitative characteristics. One of the conclusions of this chapter is that Chinese stocks (not only dual listed stock but the entire universe of Chinese stocks) seem not to be normally distributed. This is in line with the results found in other markets. The analysis is performed at an individual company level (analyzing all the companies listed rather than the more usual index based approach). The purpose of this approach is trying to get more granular information of the market than perhaps is lost when the analysis is performed at an index level. Another main conclusion in this chapter is that there are indications that long term returns (12 months) are statistically equal (A-share and H-share returns). It was also found that the common assumption that the Hong Kong market is more volatile than the A-share market for any given long period of time (12 months) does not hold in general. It is however acknowledge that the A-share markets do tend to be more volatile than the H-share market. It was also found that the assumption that the A-share market reacts in a more volatile way to market events, such as profit warnings, is not always true. Another of the conclusions of this of this chapter is that the introduction of the QFII program, which allows foreign investors access to the A-share market, had no

statistically significant impact on the market. Another major result in this section is that there seems to be two different types of dual listed companies according to their trading behavior. The first type if formed by the large state-owned banks (and related companies) and the second type if formed by all the other dual listed companies. Further work on this topic is performed on chapter 5. A factor analysis including A-H spreads and the major economic indicators was performed. It was found that a four-factor models seems to be a good alternative for this problem (a three-factor model was found not to be sufficient for the needs of an average practitioner). Importantly, it was found that stocks returns in the mainland and Hong Kong markets move in the same direction on average only 65% of the days, clearly making a trading strategy difficult. The efficient frontiers for the portfolio composed by the A-shares (dual listed) as well as the H-shares (dual listed) were calculated. The main conclusion of this analysis is that the efficient frontiers look rather different for these two portfolios.

It Chapter 4 it was mentioned that there seems to be two types of dual listed companies. One type composed by the large state-owned banks (and related companies) and the second type composed by all other dual listed stocks. In Chapter 5 further analysis on this regard was performed. A Markov-switching model was utilized to try to quantify the difference between these two types of stocks and the results were consistent with expectations. The Markov-switching model used had two states representing a bullish and a bearish market. For the large state-owned banks (and related companies) the expected duration of one of the regimes seems to be infinite. While for the other type of companies finite expected durations were obtained. This is consistent with the fact that state-owned banks are (by definition) owned by government entities (mainly China Investment Corporation and the Ministry of Finance). These two institutions are not only long term investors (they do not sale if the market conditions deteriorate) but can also support the banks (and it is expected that they do so) in the case of the banks experiencing distress. This type of

ownership seems to have also implications on the upside i.e. cap in the short term appreciation potential compared to other banks.

Volatility is often identified with risk in finance and is of significant importance for market participants. In Chapter 6 further analysis regarding the volatility of dual listed Chinese stocks (accounting for clustering effects) was performed. As a first step the existence of ARCH effects was confirmed (through an ARCH test for A-share log returns, H-share log returns and A-H spreads). Then GARCH(P,Q) model were applied to all dual listed companies (as before for A-share log returns, H-share log returns and A-H spreads). GARCH(P,Q) models are commonly used for volatility modeling and they do account for clustering effects. A comparison among GARCH models was performed (for all dual listed companies). The results seem to favor, in the vast majority of cases, the GARCH(1,1) model over the GARCH(2,1) model. In this chapter it is also shown (Airlines Case Study) that comparable companies, such as China Southern Airlines and China Eastern Airlines, do not necessarily best fit the same model.

In Chapter 7 the main conclusions of this dissertation are (from all the previous chapters) reviewed.

Chapter 1. Chinese capital markets

1 .1 Introduction to Chinese Capital Markets

The Chinese capital market has experience a tremendous growth during the last two decades both in size as well as in level of sophistication. One of the main features of this market is that it is a closed one i.e., foreign institutions and individuals have considerable restrictions accessing this market. Similarly, local investors also have restrictions on overseas investments. Despite this, the Chinese capital market has experienced a very rapid development, for instance there were more IPOs in China in 2011 than in any other country in the world. In this first chapter the major characteristics of the Chinese capital markets are presented including the differences on the investors base and regulators in the Hong Kong market and in the mainland market. The currency issue is also analyzed.

While the mainland China market remains as a largely closed one for foreign investors the Hong Kong market is an opened one allowing investors to trade securities in this market with very few restrictions. In recent years the Chinese authorities have started to open up the mainland market and are allowing some foreign investors to access this market through a couple of pilot programs. These pilot programs are called QFII and RQFII and are explained in this chapter. It should be noted that these pilot programs are very small compared to the overall size of the market.

Currency

The legal tender in mainland China is the Renminbi (RMB) also called Chinese Yuan (CNY). This currency is not freely convertible into foreign currencies. The RMB trades within a very narrow band to the USD. The legal tender in the Special Administrative Region of Hong Kong is called Hong Kong Dollar (HKD). The Hong Kong dollar is pegged to the USD. Capital inflows and outflows into mainland China

are restricted. The Special Administrative Region of Hong Kong has an open capital market with few restrictions for international investors. The development of Hong Kong's capital market started earlier than the one in the mainland. The Chinese authorities have expressed publicly their desire of making the RMB a more internationally used currency. Only 5% of the foreign trade between China and the US is currently settled in RMB.

China, while allowing private enterprises to operate, has a planned economy. Every five years the government issues a plan called 5-year plan in which it describes the sectors an industries that will receive, in that period, a larger support from the government. We are currently starting the 12^{th} 5-year plan.

Overall, the equity capital markets is more developed that the fixed income capital market (this has been acknowledge by the securities regulator "China Securities Regulatory Commission"). Currently, in the fixed income space there are a variety of securities available such as sovereign bonds, highly rated corporate bonds (there is no high yield bond market) and convertible bonds. Local investors are allowed to do repurchase agreement transactions.

Currently there are two programs that enable international institutional investors access to the mainland Chinese market. These programs are called QFII and RQFII and will we explained in detail further in this article. There is also a program that enables mainland Chinese investors access to the overseas market (QDII). While all these programs are already functional their size, compared with the overall market is negligible.

1.1.1 Chinese equity securities

There are several types of stocks in the Chinese market. The main types are: A-shares B-shares and H-shares.

A-shares were originally designed for domestic Chinese investors. They are traded in the Shanghai and Shenzhen Stock markets and are denominated in RMB. Foreign investors cannot access this market, the only exception is foreign institutional investors holding a license called QFII ("Qualified Foreign Institutional Investor").
B-shares were created with the purpose of allowing international investors access to the mainland China market. B-shares are denominated in RMB and settled in USD (in the Shanghai Stock Exchange) or HKD (in the Shenzhen Stock Exchange). The A-share market is much bigger than the B-share market. The last IPO in the B-share market was in 2001.

H-shares are the shares of domestic (mainland China) companies that trade in the Hong Kong Stock Exchange. International investors have very few restrictions in this market.

There are many dual listed companies in China. For instance most of the large banks are listed in the A-share and H-share market. From a practical point of view it is difficult to do an arbitrage between the A-share and H-share market due to the current restrictions. As mentioned before, international investors cannot invest in A-shares unless they have a QFII license, the total quota (all participants) for QFII is around USD 20 bn, this is a very small amount compared with the overall market size. Similarly, local investors have restrictions on investing abroad. Local investors wanting to invest abroad need to have a QDII license (Qualified Domestic Institutional Investors).

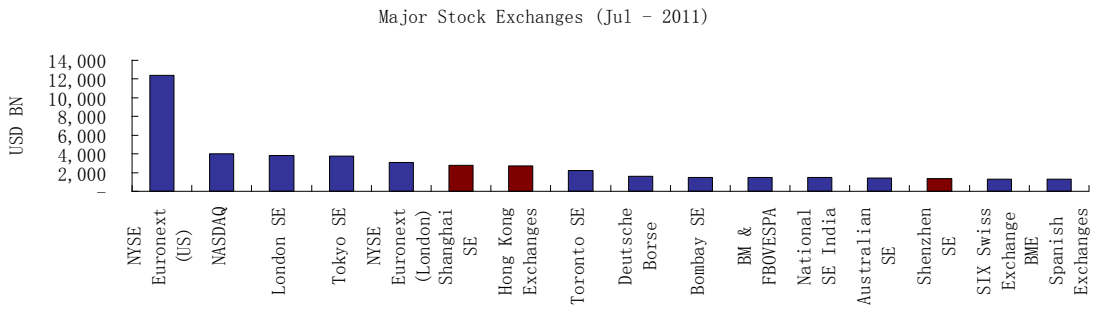
Chinese companies are traded in many other stock exchanges such as the Singapore Stock Exchange, Toronto Stock Exchange or the New York Stock Exchange.

1.1.2 Shanghai Stock Exchange (SSE)

The Shanghai stock exchange was created in 1990 and is the oldest stock exchange in

mainland China. Currently the SSE is the main exchange in China and the fifth in the world by market capitalization. The SSE is governed by the CSRC ("China Securities Regulatory Commission").

Figure 1 Stock Exchanges



Source: Bloomberg

Listing Regulations and Procedure

The SSE is a modern stock exchange with listing requirements similar to many other major international exchanges. In fact it is easy for many Chinese companies to list in Hong Kong or in overseas markets than in the mainland. The CSRC approves IPO listings and is more involved in the process than other international regulators such as the SEC in the US. For instance, IPO underwriters in mainland China have to price a new IPO within the framework given by the CSRC in contrast to other markets in which the regulator is more hand off with the pricing process and only gets involve if pricing was clearly incorrect. The CSRC does not allow floating of companies with a large amount of costumers and low sales i.e., it would be very difficult for a company like Facebook (if it were a Chinese company) to get listed in the mainland.

The SSE has the following listing requirements:

1. *The shares must have been publicly issued following approval of the State Council Securities Management Department.*

2. *The company's total share capital must not be less than RMB 50 million.*
3. *The company must have been in business for more than 3 years and have main profits over the last three consecutive years. In the case of former state-owned enterprises re-established according to the law or founded after implementation of the law and if their issuers are large and medium state owned enterprises, it can be calculated consecutively. The number of shareholders with holdings of values reaching in excess of RMB 1,000 must not be less than 1,000 persons. Publicly offered shares must be more than 25% of the company's total share capital. For company's whose total share capital exceeds RMB 400 million, the ratio of publicly offered shares must be more than 15%.*
4. *The company must not have been guilty of any major illegal activities or false accounting records in the last three years.*
5. *Other conditions stipulated by the State Council.*
6. *The conditions for applications for the listing of shares by limited companies involved in high and new technology are set out separately by the State Council".*

(Source: SSE)

Similarly, the SSE has a simple and well defined listing procedure:

1. *CSRC approval. The applications of companies for the listing of their shares are subject to the approval of the China Securities Regulatory Commission approval;*
2. *Submission of listing application documents. Only after gaining the approval of the CSRC, can the company make an application for listing to the SSE and submit the listing application documents required by the SSE.*
3. *Share custody. Before a company's shares can be listed and trading commenced, it must entrust its full register of shareholders to the Shanghai Branch of the China Securities Registration and Clearing Co., Ltd.*
4. *Determination of the date of listing;*

5. *Publish a listing notice. Following examination and verification of the SSE, the company must publish a listing notice 5 days prior to the listing and trading of its shares.*
6. *Listing and trading"*

(Source: SSE)

1.1.2.1 Indices

The most commonly quoted indices for the SSE are the SSE Composite, the SSE A-Share Index and the SSE B Share Index.

Table 1. Indexes

Index Name	Shortened Form	Launch Day	Base Day	Base Value
SSE Constituent Indices				
SSE 180	SSE 180	2002-7-1	2002-6-28	3299.06
SSE 50	SSE 50	2004-1-2	2003-12-31	1000
SSE Composite Indices				
SSE Composite Index	SSE Index	1991-7-15	1990-12-19	100
SSE New Composite Index	New SSE Index	2006-1-4	2005-12-30	1000
SSE A Share Index	A Share Index	1992-2-21	1990-12-19	100
SSE B Share Index	B Share Index	1992-8-17	1992-2-21	100
SSE Industrial Index	Industrial Index	1993-5-3	1993-4-30	1358.78
SSE Commercial Index	Commercial Index	1993-5-3	1993-4-30	1358.78
SSE Real Estate Index	Real Estate Index	1993-5-3	1993-4-30	1358.78
SSE Utilities Index	Utilities Index	1993-5-3	1993-4-30	1358.78
SSE Conglomerates Index	Conglomerates Index	1993-5-3	1993-4-30	1358.78
SSE Sector Indices				
SSE Energy Sector index	SSE Energy	2009-1-9	2003-12-31	1000
SSE Material Sector index	SSE Materials	2009-1-9	2003-12-31	1000
SSE Industrials Sector index	SSE Industrials	2009-1-9	2003-12-31	1000
SSE Consumer Discretionary Sector index	SSE Cons Disc	2009-1-9	2003-12-31	1000
SSE Consumer Staples Sector index	SSE Cons Staples	2009-1-9	2003-12-31	1000
SSE Health Care Sector index	SSE Health Care	2009-1-9	2003-12-31	1000
SSE Financials Sector index	SSE Financials	2009-1-9	2003-12-31	1000
SSE Information Technology Sector index	SSE Info technology	2009-1-9	2003-12-31	1000

SSE Telecommunication Services Sector index	SSE Telecom Svc	2009-1-9	2003-12-31	1000
SSE Utilities Sector index	SSE Utilities	2009-1-9	2003-12-31	1000
SSE Style Indices				
SSE 180 Growth index	180 Growth	2009-1-9	2002-6-28	1000
SSE 180 Value index	180 Value	2009-1-9	2002-6-28	1000
SSE 180 relative Growth index	180R Growth	2009-1-9	2002-6-28	1000
SSE 180 relative Value index	180R Value	2009-1-9	2002-6-28	1000
SSE Thematic Indices				
SSE Dividend Index	SSE Dividend	2005-1-4	2004-12-31	1000
SSE 180 Financials Index	180 Financials	2007-12-10	2002-6-28	1000
SSE Corporate Governance Index	Governance index	2008-1-2	2007-6-29	1000
SSE 180 Corporate Governance Index	180 Governance	2008-9-10	2007-6-29	1000
SSE 180 Infrastructure index	180 Infrastructure	2008-12-15	2002-6-28	1000
SSE 180 Natural Resource index	180 Natural Resource	2008-12-15	2002-6-28	1000
SSE 180 Transportation index	180 Transportation	2008-12-15	2002-6-28	1000
SSE Central State-owned Enterprises 50 Index	SSE Central SOEs 50	2009-3-30	2008-12-31	1000
SSE Fund Indices				
SSE Fund Index	Fund Index	2000-6-9	2000-5-8	1000
SSE Bond Indices				
SSE Government Bond Index	Government Bond Index	2003-1-2	2002-12-31	100
SSE Corporate Bond Index	Corporate Bond Index	2003-6-9	2002-12-31	100
SSE Enterprise Bond Index	SSE Enterprise Bond	2008-11-19	2007-12-31	100
SSE Detachable Convertible Bond Index	SSE Detachable Convertible Bond	2008-11-19	2007-12-31	100
Other Indices				
SSE Mega-cap Index	SSE Mega-cap	2009-4-23	2003-12-31	1000
SSE Medium Enterprise Composite Index	SSE Medium Composite	2008-5-12	2007-12-28	1000

(Source: Bloomberg, SSE)

1.1.3 Shenzhen Stock Exchange

The Shenzhen Stock market was formally opened in December 1990. The Shenzhen Stock Market, while smaller by market capitalization than the Shanghai Stock Exchange, is nevertheless an important market. It benefits greatly from its geographical proximity to Hong Kong (less than one hour) as well as by policies that encouraged the creation of a technological hub in the area. A relatively large proportion of companies in this stock exchange are technologically related.

According to an official statement from the Shenzhen Stock Exchange the time necessary for listing, on average, is:

1) Around 6 months, from ”corporate restructuring to the establishment of a company limited by shares”
2) 3 to 4 months for investors due diligence.
3) 3 to 4 months for exchange review and approval.

This is just a rough indication of the time involved in listing an can significantly vary from company to company. The formal listing process, according to the own exchange involves:

> *(1) Restructuring and establishment: Drafting the restructuring plan; employing intermediaries such as sponsors, accounting firms, asset appraisal agencies and law firms to study the feasibility of the plan, audit and appraise the assets of the enterprise to be restructured, sign the sponsors' agreement and draft the articles of association and other corporate documents; setting up internal organizational structure; and establishing the company limited by shares by means of promotion.*
>
> *(2) Due diligence and advising: Sponsors and other intermediaries conduct due diligence on the company, make problem diagnosis, provide professional training and guidance, familiarize the company with the necessary knowledge for listed companies, improve its organizational structure and internal management, standardize corporate conduct, define its business objectives and the purpose of the proceeds, rectify deficiencies according to listing requirements, prepare IPO application documents, and pass the inspection by local regulatory authority on their coaching activities.*
>
> *(3) Submission of application: Enterprises and intermediaries prepare application documents according to the CSRC's requirements. Sponsors*

conduct internal review and make recommendations to the CSRC. The CSRC will accept the application if it meets relevant conditions.

(4) Review of application documents: After acceptance of the application, the CSRC will conduct a preliminary review. It will also consult with the provincial governments, the National Development and Reform Commission (for listing on the ChiNext, there is no need for such consultation and the CSRC will only need to communicate with the province-level government on the share offer) and minister of commerce (for Sino-foreign joint ventures and foreign enterprises). Then the CSRC will provide its opinion to sponsors which will make arrangement for the issuer and intermediaries to respond to the opinion or remedy any deficiencies. After that, pre-disclosure will be made and the application documents will finally be submitted for review to the CSRC public offer review committee.

(5) Road show, book-building and pricing: The CSRC will grant approval to the application after it passes the review of the public offer review committee. Before the IPO, the company must perform the required disclosure obligations. Main Board listing candidates should publish the summary prospectus and IPO announcement in the newspapers designated by the CSRC. They should also publish the full prospectus and relevant documents on the websites designated by the CSRC. ChiNext listing candidates should publish the full prospectus and IPO announcement on the websites designated by the CSRC as well as on their corporate websites. Moreover, they should publish an IPO and ChiNext listing announcement in the newspapers designated by the CSRC, informing investors of such websites and how to access the relevant documents. Then the lead underwriters (securities firms) and issuers will conduct road show, promotion and book-building and determine the issue price based on book-building results.

(6) IPO and listing: The issuer will launch its IPO according to the method prescribed by the CSRC. Then it will apply to the stock exchange for listing, complete custody and registration procedures at the registration and settlement company, and get listed. After listing, the sponsor will be responsible for continuous supervision and guidance.

(Source: Shenzhen Stock Exchange)

1.1.4 Hong Kong Stock Exchange

The Hong Kong Stock Exchange was formed in 1891. In this initial phase the Hong Kong Stock Exchange was called "Association of Stockbrokers in Hong Kong". It was not until 1914 that the exchange was renamed with its modern name "Hong Kong Stock Exchange". The exchange has experienced profound political changes since its inception. When the exchange was formed Hong Kong was under British control as a result of the defeat of China in the first opium war. As a consequence, the exchange was originally a British institution that followed British standards.

From 1941 to 1945 Hong Kong was occupied by the Japanese army. The economy of Hong Kong, as in many other parts of the world, was basically paralyzed during this period. The local currency was replaced by the Japanese yen. During this period Hong Kong experience hyperinflation.

In 1945 the Japanese army in Hong Kong was defeated by the British army. The economic recovery of Hong Kong after the war was pretty remarkable, achieving one of the highest GDP per capita in Asia. Hong Kong capital market developed rapidly on the back of this economic growth. By the 1980s there were four stock exchanges in Hong Kong. This was view by many [Hong Kong Securities Institute] as an issue and a phase of mergers followed.

In 1997 Hong Kong was returned to the PRC under the "one country, two systems approach". Under this arrangement Hong Kong has its own laws and rules governing the exchanges and securities trading in general. These laws are not the same that the ones in the mainland. The regulatory bodies are also different.

When the Shanghai Stock Exchanged was formed in 1990 the Hong Kong Stock Exchange had already functioned for roughly 100 years. Some of the regulations governing the Shanghai Stock Exchange were adapted from the Hong Kong Stock Exchange (Taiwanese Securities law was according to some scholars, such as Gregory Chow, the other big influence on mainland securities law and regulations).

1.2 Cross border programs

1.2.1 Qualified Foreign Institutional Investor (QFII)

The QFII program was introduced in 2002 by the CSRC, which is one of the main regulatory bodies in the Chinese capital market. The program allows qualified international institutional investors to access the domestic mainland China market. QFII investors can invest in A-shares, fixed income products (as long as they are traded on an exchange), warrants and Open-End funds. There is a process in place by which companies that are granted a QFII license can exchange foreign currency into RMB (the RMB remains a non-fully convertible currency). There are two key regulatory bodies involved, the CSRC and SAFE. The CSRC grants the licenses. Not all institutional investors qualify for this program as there are several requirements such as minimum assets under management, profitability or years of experience.

Table 2. CSRC Requirements

CSRC Requirements (source: China Securities Investor Protection Fund Corporation)
1) Fund management companies. *At least 5 years of experience in asset management* *Managed a minimum USD5 billion of securities in the most recent accounting year*
2) Insurance companies *At least 5 years of history after establishment* *Held a minimum USD5 billion of assets in the most recent accounting year*
3) Securities companies *At least 30 years of experience in securities operation* *No less than USD1 billion of paid-in-capital* *Managed a minimum USD10 billion of assets in the most recent accounting year*
4) Commercial banks *By total assets, ranked among Top 100 in the world in the most recent accounting year* *Managing no less than USD10 billion of assets*
5) Other institutional investors (pension funds, trust companies, charitable foundations and donation foundations) *At least 5 years of history after establishment* *Managed or held a minimum of USD5 billion of assets in the most recent accounting year.*

(source: China Securities Investor Protection Fund Corporation)

The QFII program was a pioneering program in the Chinese capital markets. In fact a few years before the launching of the program several senior officials denied the possibility of opening up the A-share market. For instance, Zhu Rongji in an interview with the Wall street Journal in April 1999 said "*we can still open up B shares, but we can't allow A-Shares to be opened up. If the US insists that A-shares be opened up, that will; be something China cannot do. Moreover, we've seen that if we were to go ahead and do that, we'd only be following in the footsteps of South East Asia during the financial crisis*". At the time of this interview mainland Chinese investors were not allowed to purchase B-shares and foreign investors could not purchase A-shares.

1.2.2 RFII

RQFII is a new program that allows offshore RMB funds based in Hong Kong to

invest in the mainland China market. At the moment, the size of this pilot is rather small (RMB 20 billion or circa USD 3.2 billion). This project has also several limitations, for example only 20 financial institutions have been allowed so far to access this project. More importantly, 80% of the fund has to be invested in fixed income securities, the rest (20%) can be invested in equities and other approved securities such as mutual funds. This is clearly not a way in which an A-share versus H-share arbitrage could be effectively accomplished at a large scale given that the total amount of capital that can be invested in equities is RMB 4 billion (circa USD 635 million), which is approximately 0.02% of the market capitalization of the Shanghai Stock Exchange.

Table 3. RQFII funds

RQFII Funds	
Bosera Fund	Guotai Securities
China AMC	Guoxin Securities
China Merchants Securities	Guoyan Securities
China Universal Fund	Haitong Securities
CICC	HFT Investment
CITIC Bank Securities	Huatai Securities
CSOP	SWS Securities
Dacheng International	The E Fund
Essence International	The Harvest Fund
Everbright Securities	Huanan Fund
Gungfa Securites	

Source: CSRC

1.2.3 QDII

The Qualified Domestic Institutional Investors (QDII) program enables domestic investors to invest in the overseas market. No more than 50% of the fund can be invested in the equity space. Investors can only invest in countries that have signed a Memorandum of Understanding with China. There is a bilateral agreement (2008) between the US Securities and Exchange Committee and the CSRC by which local Chinese investors can invest on US equity securities. Others countries and regions

that have already signed an agreement with the People's Republic of China regarding this matter are the Special Administrative Region of Hong Kong, Japan, Malaysia, The United Kingdom, Canada, Singapore, Australia, Germany and Luxemburg.

Chapter II, Articles 5,to 12 of the CSRC's "Qualification Requirements for QDIIs, and Examination and Approved Procedures" describe the minimum set of requirements that a fund needs to have to qualify as a QDII. (Source: CSRC and HTF fund).

Article 5

When applying for the QDII qualification, applicants shall satisfy the requirements as follows:

1. Having a stable and good status of finance and credit, and its assets scale and operating life, etc. satisfy the requirements as prescribed by the CSRC;

2. Having related qualified staff that has the experiences in investment management outside the territory of China;

3. Having a sound governance structure and a perfect internal control system, as well as normalized business performance;

4. Having not been subject to any major punishment by the surveillant organ for the last three years, and having nothing important being investigated by the judicial organ or the surveillant organ; and

5. Other requirements as prescribed by the CSRC in accordance with the principle of prudent surveillance.

Article 6

The requirement referred to in Article 5 Subparagraph (1) means that:

1. For a fund management company: its net asset shall be no less than RMB 0.2 billion yuan, it has engaged in the business of managing securities investment funds (hereinafter referred to as the fund) for more than two years, and its asset management scale at the end of the latest quarter shall be no less than

RMB 20 billion yuan or the foreign exchange assets in an equivalent value;
2. For a securities company: all of its risk control indicators shall be consistent with the prescribed standards, its net capital shall not be less than RMB 0.8 billion yuan; the proportion of its net capital to its net assets shall be no less than 70 percent, it has engaged in the business of asset pool management plans (hereinafter referred to as the pool plan) for at least one year, and its asset management scale at the end of the latest quarter shall be no less than RMB 2 billion yuan of assets or the foreign exchange assets in an equivalent value.

Article 7
The requirement referred to in Article 5 (2) means that: an applicant shall have one or more medium-level manager(s) that have the investment management experiences in the securities market outside the territory of China for at least five years and related qualification, and shall have three or more staff members that have the investment management experiences in the securities market outside the territory of China for at least three years.

Article 8
When applying for the QDII qualification, an applicant shall submit to the CSRC the documents (one original and one duplicate thereof) as follows:

1. an application form;
2. a certification document as prescribed in Article 5 of the present Measures; and
3. other documents as required by the CSRC.

Article 9
The CSRC shall examine such application documents as of the receipt of a complete set of qualification application documents, and make a decision on

approval or disapproval. In the case of approval, the CSRC shall issue a licensing document for securities investment business outside the territory of China; and in the case of disapproval, the CSRC shall inform the decision to the applicant in written form.

Article 10
After an applicant has obtained the QDII qualification, it may submit the documents for a product raising application to the CSRC.

Article 11
After receiving a complete set of the documents for a product raising application, the CSRC shall examine the application materials, make a decision on approval or disapproval, and inform the applicant of the decision in the written form.

Article 12
A QDII shall apply to the SAFE for the qualification for foreign exchange business in accordance with related provisions.
(Source: CSRC and HTF fund)

1.2.4. Offshore ETFs

It is possible for foreign investors without a QFII license to invest in the A-share market by purchasing some of the existing ETFs in Hong Kong. For instance the Morgan Stanley China A-Share Fund (at least 80% f the fund is invested in A-shares). This is a common structure for funds that need to provide daily liquidity for their clients as the QFII pilot only allows (at most) for weekly liquidity.

Morgang Stanley China A Share fund, Inc.					
Common stocks	**Shares**	**Value ('000)**		**Shares**	**Value ('000)**
Auto components (3.2%)			**Information Technology Services (1.1%)**		
Huayu Automotive Systems Co., Ltd., Class A	10,558,637	14,977	Hand enterprise solutions co., Ltd	1,896,095	5,163
Automobiles (8.2%)			**Insurance (10.2%)**		
SAIC mottor Corp., Ltd	17,172,646	38,794	China Pacific Insurnce Group Co.,Ltd, Class A	3,747,452	13,134
Beverages (3.9%)			Ping An Insurance Group Co., Class A	4,893,883	35,390
Tsingtao Brewery Co., Ltd, Class A	3,110,130	18,724	**Machinery (1.9%)**		
Capital Markets (6.2%)			ZhenzhouYutong bus Co., Ltd Class A	2,512,289	8,897
CITIC Securities, Class A	8,210,243	16,400	**Media (1.14%)**		
Haitong Securities Co., Ltd	5,881,200	8,172	Bona Film Group LTD ADR	891,500	5,073
Haitong Securities Co., Ltd Class A	3,136,800	4,776	**Metals & Mining (4.6%)**		
Chemicals (2.6%)			Baoshan Iron & SteelCo., Ltd	1,992,790	13,576
Qinghai Salt Lake Industry Co., Ltd Class A	2,310,068	12,331	Shangdong NanbshanAluminium Co., Ltd Class A	7,973,010	8,440
Commercial Banks(8.4%)			**Oil, gas & consumable fuels (4.6%)**		
China Merchants Bank Co., Ltd Class A	23,069,632	39,769	China petroleum & chemical Corp., Class A	8,775,043	8,717
Construction & Engineeerig (3.8%)			Shanxi Xishan Coal & Electricity Power Co., Ltd, Class A	5,278,811	13,041
China Estate Construction	34,451,463	18,159	**Pharmaceuticals (2.9%)**		
Construction materials (4.7%)			Jiangsu Hengrui Medicine Co., Ltd	3,052,763	13,816
Anhui Conch Cement Co., Ltd	9,560,127	22,372	**Real Estate (4.9%)**		
Electrical Equipment (0.9%)			China Vanke Co., Ltd, Class A	10,004,265	14,073
TBEA Co., Ltd	4,019,869	4,299	Shanghai Shimao Co., Ltd	5,337,249	9,283
Food & Staples Retailing (3.8%)			**Road & Rail (1.0%)**		
Zhongbai Holdings group Co., Ltd Class A	15,117,987	17,802	Daqin railway Co., Ltd	4,231,400	4,696
Health care providers & services (3.6%)			**Software (6.6%)**		
Shanghai Pharmaceuticals Holding Co., Ltd., Class A	2,127,730	3,599	UFIDA Software Co., Ltd, Class A	13,056,729	31,536
Shanghai Pharmaceuticals Holding Co., Ltd., H-shares	10,593,400	13,291	**Specialty Retail (3.4%)**		
Household durables (4.4%)			Suning applianes Co., Ltd, Class A	12,058,412	16,031
Gree electric apppliances	6,358,021	20,945	**Transportation infratruture (1.9%)**		
			Jiansu Expressway Co., Ltd	9,756,859	9,039

Source: Morgan Stanley Shareholder report (July 2012)

Another popular ETF is the (Blackrock) ishares FTSE A50 China Index ETF. This is a synthetic ETF and hence does not directly invest into A-shares. This product is a synthetic ETF:

> *"The underlying securities to which the underlying index relates (A shares) may no be directly invested by non PRC persons, such as the A50 China ETF , unless the person is a Qualified Foreign Institutional Investor. Neither the manager nor the A50 China ETF is a QFII, meaning that the A50 China ETF cannot invest directly in or hold A-shares directly.*
>
> *In order to meet the investment objective, the manager on behalf if the A500 China ETF, will therefore invest in derivatives instruments which are intended to provide economic performance equivalent to holding an A-share"*

Source: shares FTSE A50 China Index ETF prospectus.

There are a few other ETFs available but they basically have the same characteristics (index based). There are some China sector ETFs (for example financial sector) but they are mostly composed by H-shares.

1.3 Regulatory bodies

1.3.1 Mainland China Regulatory bodies

1.3.1.1 China Securities Regulatory Commission (CSRC)

The CSRC was formed in 1992 and is the main regulatory organization in the securities space in the PRC. It is authorized by the State Council and has ministry level rank. The aim of the CSRC is "*the maintenance of a fair and efficient market*" (source CSRC). The CSRC is a large organization with 18 departments. The CSRC has also an enforcement branch and local offices spread across China.

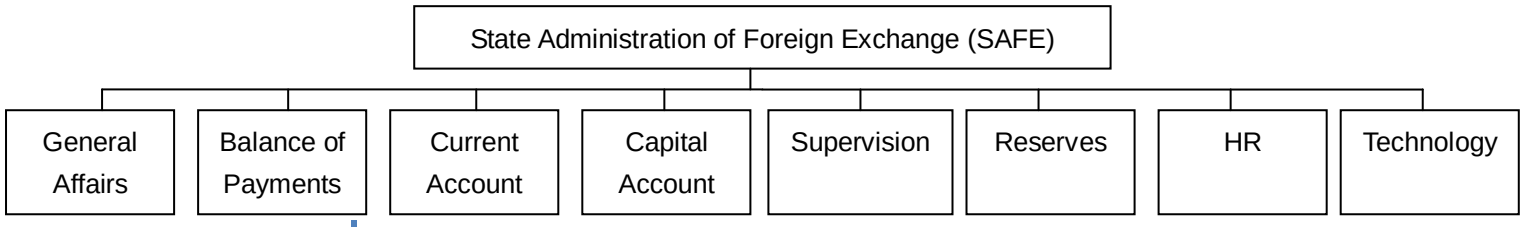
There are two important committees under the CSRC: the Public Offering Review Committee and the Administrative Sanction Committee. The Public Offering Committee (POC) is in charge of reviewing the fitness of companies for public offering purposes ("…the [POC] s*hall examine and verify whether an application for share issuance meets the conditions for public share issuance*"). The administrative Sanction Committee is in charge of defining what a securities violation is, hearing specific cases and suggesting sanctions.

CSRC is responsible for regulating equities, bonds, convertible bonds, mutual funds and futures. The CSRC is also responsible for granting QDII and QFII licenses.
A description of the current leadership of the CSRC can be found in Appendix 2. The CSRC is perhaps the regulatory body with more power in China.

1.3.1.2 State Administration of Foreign Exchange (SAFE)

SAFE is another large and complex organization with the following departments:

Figure 2. SAFE



SAFE is responsible for the safe keeping and investment of China's massive foreign exchange reserves (in excess of USD 3.1 trillion as of June 2011) as well as regulating the foreign exchange market in the PRC. SAFE is officially a "deputy-ministerial-level state administration" (source SAFE).

> *1. To study and propose policy suggestions on the reform of the foreign exchange administration system, prevention of the balance of payments risks, and promotion of the balance of payments equilibrium; to study and implement policy measures for the gradual advancement of the convertibility of the RMB under the capital account and the cultivation and development of the foreign exchange market; to provide suggestions and a foundation for the People's Bank of China to formulate policy on RMB exchange rate.*
>
> *2. To participate in the drafting of relevant laws, regulations, and departmental rules on foreign exchange administration, releasing standard documents related to the carrying out of responsibilities.*
>
> *3. To oversee the statistics and monitoring of the balance of payments and the external credit and debt, releasing relevant information according to regulations and undertaking related work concerning the monitoring of cross-border capital flows.*
>
> *4. To be responsible for the supervision and management of the foreign exchange market of the state; to undertake supervision and management of the settlement and sale of foreign exchange; to cultivate and develop the foreign exchange market.*
>
> *5. To be responsible for supervising and checking the authenticity and legality of the receipt and payment of foreign exchange under the current account according to law; to be responsible for implementing foreign exchange administration under the capital account according to law, and to*

continuously improve management work in line with the convertibility process of the RMB under the capital account; and to regulate management of overseas and domestic foreign exchange accounts.

6. To be in charge of implementing supervision and checking of foreign exchange according to law, and punishing behaviors that violate the foreign exchange administration.

7. To undertake operations and management of foreign exchange reserves, gold reserves, and other foreign exchange assets of the state.

8. To arrange development planning, standards, and criteria for IT-based foreign exchange administration and organizing relevant implementation; to realize supervision of information-sharing with the relevant administrative departments according to law.

9. To take part in relevant international financial activities.

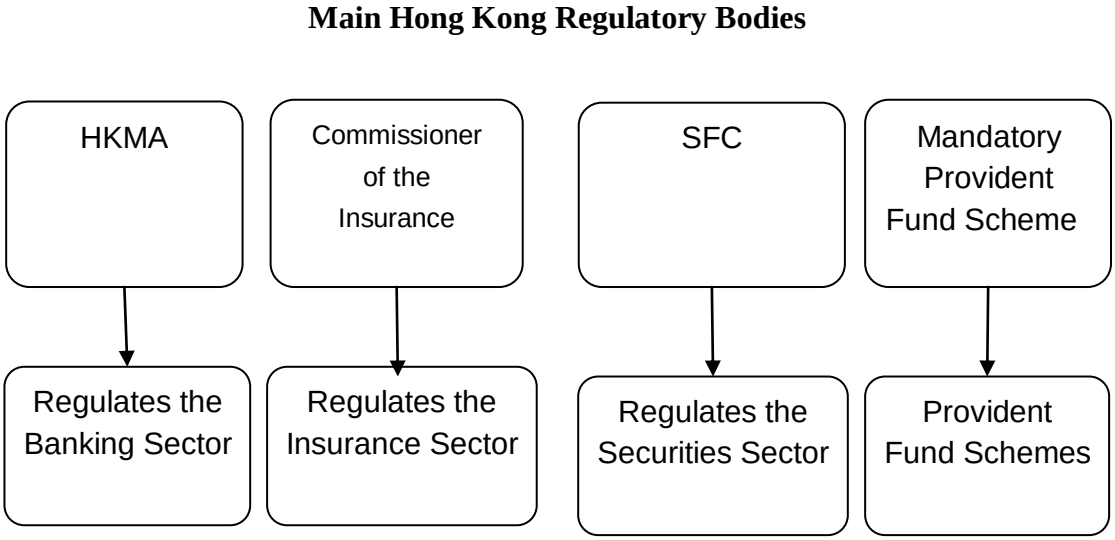
10. To undertake other matters as assigned by the State Council and the People's Bank of China.

Source (SAFE)

1.3.2 Hong Kong Regulatory Bodies

Hong Kong has independent financial regulatory bodies from their mainland counterparties. The main regulators are the Hong Kong Monetary Authority (de-facto central bank of Hong Kong), the Securities and Futures Commission (SFC), the Office of the Commissioner of the Insurance and The Mandatory Provident Fund Schemes Authority.

Figure 3. Hong Kong regulatory bodies



Source: SFC

1.3.2.1 Hong Kong Monetary Authority

The Hong Kong Monetary Authority is the de facto central bank of Hong Kong. According to the HKMA its main functions are:

- *Maintaining currency stability within the framework of the Linked Exchange Rate system*
- *Promoting the stability and integrity of the financial system, including the banking system*
- *Helping to maintain Hong Kong's status as an international financial centre, including the maintenance and development of Hong Kong's financial infrastructure*
- *Managing the Exchange Fund.*

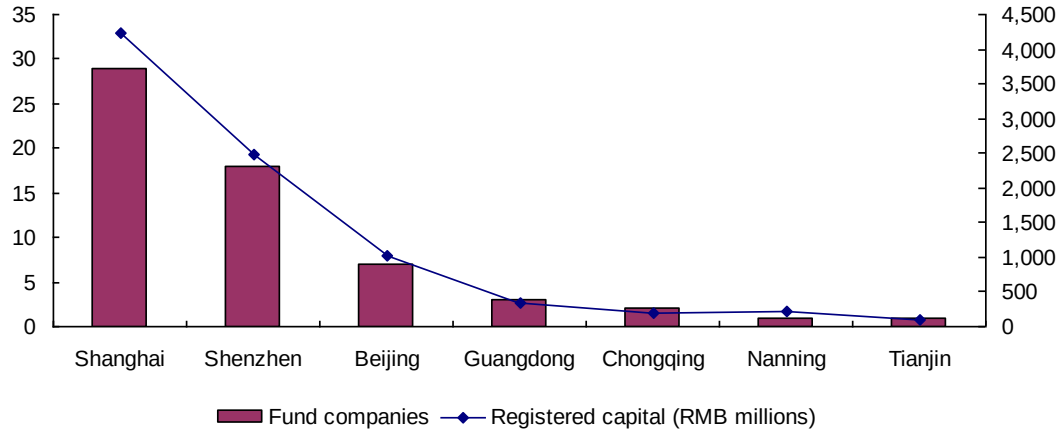
Source: HKMA

The HKMA is the entity responsible of maintaining the current peg of the HKD with the USD (at around 1USD = HKD 7.8)

1.4. Investment funds

As of April 2009 there were 61 fund management companies in China approved by the CCRC, of those 29 were located in Shanghai. Shenzhen is now the second largest hub for fund companies.

Figure 4. Fund Companies



Source: Bloomberg

1.5. SHIBOR

SHIBOR is the Chinese equivalent of LIBOR, which explained in simple terms is the rate at which banks are ready to lend to other banks (short term). According to the National Interbank Funding Center, which is authorized by the PBoC to calculate SHIBOR, the definition is:

> *a simple, no-guarantee, wholesale interest rate calculated by arithmetically averaging all the interbank RMB lending rates offered by the price quotation group of banks with a high credit rating. Currently, the Shibor consists of eight maturities: overnight, 1-week, 2-week, 1-month, 3-month, 6-month, 9-month and 1-year.*

> *The price quotation group of Shibor consists of 16 commercial banks. These quoting banks are primary dealers of open market operation or market makers in the FX market, with sound information disclosure and active RMB transactions in China's money market. Shibor Working Group of PBC decides and adjusts the panel banks, supervises and administrates the Shibor operation, and regulates the behavior of the quoting banks and the specified publisher in accordance with the Implementation Rules of Shibor*

SHIBOR is calculated on a daily basis and published at 11:30 AM Beijing time

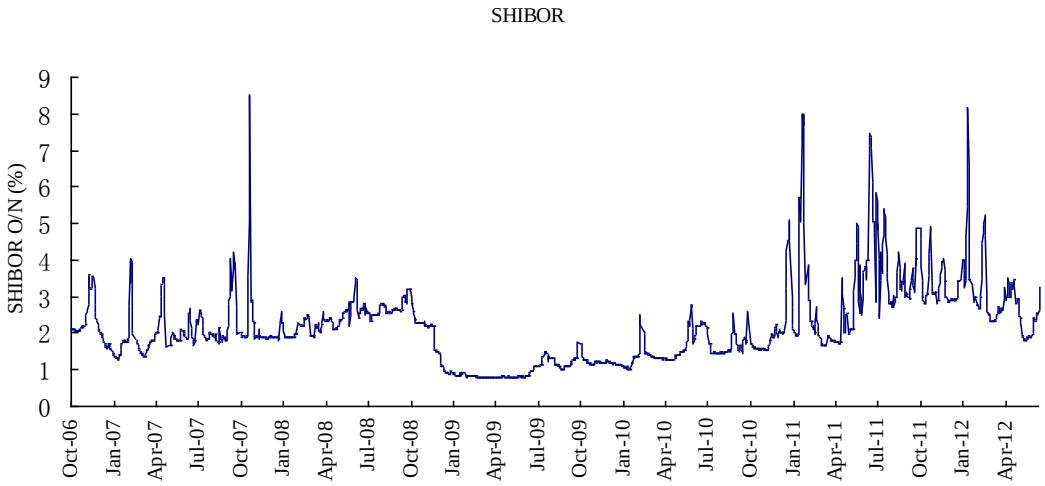
Table 4. SHIBOR

SHIBOR - Panel Banks	
ICBC	Industrial Bank
Agricultural Bank of China	Bank of Beijing
Bank of China	Bank of Shanghai
China Construction Bank	HSBC
Bank of Communications	Standard Chartered Bank
China Merchants Bank	Huaxia Bank
CITIC Bank	China Guangfa Bank
China Everbright Bank	China Development Bank

Source: National Interbank Funding Center

Occasionally there are spikes in the SHIBOR. For instance in the last few years the overnight rate reached 8% in a few occasions. 8% overnight rate basically means that the market is close i.e., banks not able to finance to borrow. This, according to market practitioners, has a direct impact on the market.

Figure 5. SHIBOR



Source: Bloomberg

There are other two key money market rates: 1) CHIBOR and 2) Interest rate swap (which uses the SHIBOR). The SHIBOR is perhaps the closest equivalent to the LIBOR as it is determined by the submission of the participant banks (same way than Libor). CHIBOR on the other hand is based on actual transaction, rather than the estimated values by the banks. The CHIBOR does the advantage that it is less prone to manipulation. The interest rate swap approach was introduced recently in the market but it failed to gain traction among practitioners and it is rarely used.

1.6. PBoC liquidity management.

As previously mentioned, liquidity is an important factor when analyzing stocks returns in China. In order to manage liquidity the PBoC has several tools such as increases in bank requirement ratios, RRR changes or repo (reverse repo) operations. The PBoC frequently does reserve repo operations in order to support the market. When these repo operations are announced the market typically has some support. Anecdotic evidence seems to show that these reserve repo operations have larger impact in the A-share market. It should be noted that Hong Kong has its own (de-facto) central bank the Hong Kong Monetary Authority.

1.7. Chapter conclusions

This first chapter is a brief introduction to Chinese capital markets (including both mainland and Hong Kong markets). The chapter starts with an introduction to Chinese securities such as A-share (traded in the mainland and originally intended for domestic investors), B-shares (traded in the mainland and originally intended for foreign investors) and H-shares (traded in Hong Kong and intended for Hong Kong and overseas investors). Some of the major pilot programs allowing foreign investors accessing the mainland China market, such as QFII and RQFII, were also introduced in this chapter. One of the key points is that while these programs have ran relatively smoothly for a few years now, their impact in the overall mainland market is small probably due to the relatively small size of those pilots (roughly 2% of the overall market). The QDII pilot is also introduced in this section. The QDII pilot allows qualified domestic investors to invest in overseas markets (Hong Kong market counts, for regulatory purposes, as an overseas market). Some of the major regulatory and overseeing bodies were also introduced in this section including: China Securities and Regulatory Commission (CSRC), State Administration of Foreign Exchange (SAFE) and the Hong Kong Monetary Authority (HKMA). HKMA is the de-facto central bank of Hong Kong. Some other basic concepts related to the Chinese market such as SHIBOR (the Chinese equivalent of LIBOR) were also introduced.

Chapter 2. Corporate Governance and demographics

2.1. Introduction

Two key elements, perhaps of a more qualitative nature, required in order to understand the behavior of Chinese dual listed stocks are corporate governance (difference between Mainland China and Hong Kong) as well as Chinese demographics. Given the large percentage of Chinese retail investors in the stock market having a basic understanding of its characteristics seems necessary. In this chapter it is also shown the results of a survey of Chinese retail investors.

Understanding the difference between the mainland market and Hong Kong market on regulation is very important when analyzing dual listed Chinese stock as it has been mentioned by many scholars and analysts that there are noticeable corporate governance differences between these two markets which could cause a premium to exist in some of those markets. Nevertheless it should be noted that there have been considerable improvement in the corporate governance space in the mainland and that the differences between these two markets are arguably not as big as they used to be.

Understanding mainland China demographics is also crucial for understanding dual listed companies behavior as the Chinese retail investors represent the bulk of the market in the mainland. Hong Kong is rather different in this respect with institutional players dominating that market. It is safe to assume that the financial knowledge of an average retail investor and average institutional investors are not the same. Also retail investors tend to show more herd behavior than institutional investors, which could potentially clearly create price distortions between the stock prices in both markets

2.2. Corporate governance impact on securities performance. China versus Hong Kong comparison

Corporate governance in China and Hong Kong is radically different. There is extensive literature covering this topic. For instance [Allen] said that "*[China] corporate governance, accounting standards and investor protection systems are poor at best, judging by existing standards in the literature, while its banking system is not well developed and is to a large degree inefficient*". On the other hand, the Hong Kong legal system, including matters related to investor protection, is considered by many industry practitioners and academics [Jane W. Lu] as one of the most developed in the world. This, at least in principle, should help the performance of the Hong Kong market. When analyzing dual listed companies it would be logical to assume that the security that trades in the market with better investor protection rules should trade at a premium. However, the data is not consistent with this assumption as Hong Kong stocks (of dual listed companies) tend to trade at a discount from its mainland China counterparties.

2.3. Corporate governance. Literature review

There are numerous articles analyzing corporate governance in China as well as Chinese demographics. While these two topics are not the core of this dissertation, it is important to understand some of their fundamental characteristics and their impact in the capital market.

It is believed by several authors that the Hong Kong securities legal system is more robust than the mainland one [Chen Yun], [Chunshui Wu]. For instance [Chen Yun] mentions that "Hong Kong's corporate law and its enforcement mechanism offer much greater protection to minority shareholders than China's mainland company law". Rather than comparing the performance of dual listed stocks in both markets [Chen Yun] article analyses the difference in performance between dual listed and not dual listed stocks. [Chen Yun] shows that dual listed stocks tend to be larger

companies with a more diverse investors pool (as they have domestic and international investors). Interestingly [Chen Yun] concludes that the difference in returns between dual listed and non-dual listed companies are "statistically indifferent". [Chen Yun] compares his results with the article written by [Doidge], which basically arrives to the opposite conclusion. It should be noted that Doidge article is not China specific. [Chen Yun] results also seem to be opposite to [Lei]'s results. [Lei] defends, in a well-known article, that H-share investors in Hong Kong are willing to pay a premium for companies with good corporate governance. On an individual stock level there are some indications that Chinese companies with strong corporate governance procedures outperform the rest [Tang]. Perhaps the main points from the literature are the robustness of the Hong Kong securities legal system [Brown] with the second point that a strong corporate governance system should be reflected in valuations. This second point seems not to be consensus with some articles defending the opposite view.

There are several articles describing the trends in Chinese demographics. One of the major trends cited in the literature is the aging population. There seems to be several views about its implication to the Chinese economy. According to [Banister] by 2050 more than 30% of the Chinese population will be above 65. One of the main takeaway points from this article is that Chinese economic growth will indeed slowdown in the future but that the main reasons is not an aging population but a natural process by which countries with higher income tend to grow at a slower rate that countries with low incomes. This article also mentioned that the several structural reforms in areas such as pensions or health care would be beneficial for a more stable economic growth. [Tyers] wrote an interesting article analyzing the impact of population in Chinese GDP growth. [Tyers] mentions that several developing countries around China do not have the issue of an aging population. According to [Tyers] analysis "shifting to a two child policy will increase GDP growth a tenth". Another frequently quoted report is the one written by [Jackson]. The main point of this report seems to

be that important structural changes (similar to Tyers view) are needed. [Jackson] report seems to put more weight in the impact of an ageing population in the overall economy than [Banister]. Nevertheless, there seems to be an agreement between these three authors that an ageing population will in fact impact economic growth (the disagreement seems to be more about the size of this impact).

The IMF in a recent report written by [Il Houng Lee] modeled the impact on savings (saving ration in China is much higher than in most of the developed countries). One of the main points of this report is that according to the author, China needs to change its growth model. According to this report "*China's changing demographics make it essential to find a new growth model, since it can no longer rely on a large dividend and savings*". The concept behind this conclusion is relatively simple. As the labor force (proportionally) shrinks the labor force will demand higher compensation producing a net transfer of wealth from the corporate to the labor force.

There is also a very large amount of reports analyzing the current situation of the Chinese social security system and the necessary modifications to cope with an ageing population. For instance [James] identified three factors that slowed done the reform of the social security system over the last decade. According to his work these major three factors are: "*1) transition cost must be covered in any move towards prefunding, and the Chinese government is still trying to figure out how to accomplish this. 2) the current (referring to the system at the beginning of the decade) social security system is characterized by fragmentation and decentralized administration, which lead to principal-agent moral hazard issues that make it more difficult to cover transaction costs, decrease early retirement and increase compliance. 3) the funds that have accumulated have not been invested in diversified portfolios by private competitive management and have not earned a high rate of return*".

2.4. Demographics

Given the large proportion of retail investors in the mainland China market, it is important to understand the demographics of this population. Since the open door policy was installed by Den Xiaoping, China has experienced tremendous growth. Socially the country has also changed with the development of a middle and upper class with distinctive consumer behaviors. Perhaps the most accepted segmentation of the Chinese consumer was the one proposed by Xiao Lu (Xiao Lu, Pierre). Xiao Lu divides Chinese consumers into 4 main blocks: retail, mass affluent, affluent and rich. These four groups have very different consumer behaviors. For instance, the rich tend to spend in a less "visible way than the mass affluent. According to Xiao Lu, the rich are already socially established and their position in society is clear. Therefore they do not need to display luxury items to reaffirm their position. This is not the case for the mass affluent and the upper level of the affluent categories. These two sectors obtained their wealth at a later stage and often use the display of luxury brands as a way to show their newly acquired social status. While the purpose on this article is not to segment the stock trading styles and patterns of these four groups, it is important to understand that they are likely to behave in radically different ways, given their drastically different disposable income, cultural level, expectations and risk appetites.

The Chinese consumer saves, on average, a much higher proportion of their salary than American or European consumers. This is due to socio-economic factors such tradition, saving money has traditionally been regarded as a virtue in China, or the lack of a comprehensive pension system. The lack of a comprehensive pension system is obviously one of the main factors influencing these spending habits. Traditionally, upon retirement, most Chinese relayed on a mixed of savings and family support. It is not unusual to see retired parents moving in with their children (most often than not the eldest son). This is clearly changing with the introduction of the one child policy.

From a consumer spending angle, the one child policy has had a deep impact. In most of the economically developed cities in China each family has only one child. It is

important to remark that rural areas in China and some minority groups have more relaxed policies regarding family planning allowing them, in some occasions, to have more than one child. However, in the urban areas the vast majority of the population has just one child. Having only one child, the parents tend to put all their hopes (and physiological pressure) on their child encouraging him to study hard in order to get a good job and social recognition. It is common that middle school children study until 9:00 at night on a routinely basis. China has a system of national exams. Children since a very early age are accustomed to such system and the pressure that comes with it. Parents, in general, take the upmost care on their children performing well in these exams. One of the positive effects of this policy is the large degree of equality achieved within genders in urban areas, it does not matter that the child is a boy or a girl, because the family only has one child the family hopes that he/she will be successful. Success is clearly an important part of the modern Chinese society not only improving the economic situation of the family as a whole but also enhancing the social status of the family. This pressure on the child comes also with short-term benefits, for instance young adults studying at universities tend to have a reasonable disposable income provided from their parents. This disposable income makes this subgroup an interesting target market for companies.

Until this point we have not discussed differences among regions in China. China is a vast and highly populated country. The difference in average income and economic development between provinces is quiet big.

Table 5. China GDP

GDP per capita in USD (Chinese regions versus comparable countries			
Shanghai	10,779	Brazil	10,710
Tianjin	10,353	Latvia	10,705
Beijing	10,331	Turkey	10,106
Jiangsu	7,647	Panama	7,614
Zhejiang	7,356	Mauritius	7,593
Inner Mongolia	6,937	Bostwana	7,403
Guangdong	6,411	Montenegro	6,340
Liaoning	6,144	Bulgaria	6,325
Shandong	6,051	Colombia	6,225
Fujian	5,723	Bosnia and Herzegovina	4,491
Jilin	4,593	Algeria	4,495
Hebei	4,134	Maldives	4,685
Hubei	4,061	Macedonia	4,425
Chongqing	4,025	Angola	4,423
Shaanxi	3,948	Belize	4,153
Heilongjiang	3,929	Turkmenistan	4,180
Ningxia	3,835	Ecuador	4,073
Shanxi	3,742	Albania	3,678
Xinjiang	3,653	El Salvador	3,519
Henan	3,588	Fiji	3,497
Hunan	3,560	Tonga	3,435
Qinghai	3,529	Cape Verde	3,323
Hainan	3,480	Kosovo	3,080
Jianxi	3,113	Indonesia	2,946
Sichuan	3,090	Guyana	2,945
Guangxi	3,036	Republic of Congo	2,943
Anhui	3,031	Paraguay	2,862
Tibet	2,486	Iraq	2,565
Gansu	2,369	Honduras	2,026
Yunnan	2,310	Mongolia	2,207
Guizhou	1,944	Moldova	1,631

Source: Worldbank, People's Bank of China and the Chinese National Bureau of Statistics.

Figure 6 - Map of China

2.5. Survey

In an attempt to understand the behavior of the average Chinese retail investor a questionnaire was carried out. 63 persons were interviewed across different locations in China including Beijing, Shanghai, Gansu, Guangzhou and Wuhan. The age range was between 23 and 58 years old. 59% of the people interviewed are women. Mainland China retail investors are not allowed to purchase H-shares but given that many of the companies are dual listed it is interesting to know if they look at price fluctuations of H-shares (in dual listed companies). Every interviewed person was asked the same question (in Chinese):

> 当你买入或售出同时在 A 股和港股挂牌的股票时，例如中国银行，你会参考该股票在香港市场的价格吗？

Which translates into English as:

> "When buying or selling A-shares of a company that trades in Hong Kong and the mainland i.e., Bank of China A-share and H-share. Do you look at the price or recent changes in prices in the Hong Kong market i.e., changes in price of Bank

of China H-share?"

Only 18.9% of the interviewed people responded affirmatively i.e., they look at the price of H-shares when making investment decisions about A-share investments (dual listed companies). The results were very consistent across gender, age and location. 19% of the women interviewed responded affirmatively. The same percentage (19%) of men answered positively. 39.7% of the interviewed people were 30 years old or under when the interview took place. The results across age groups are also very consistent. 24% of the under 30 responded yes while only 15% of the above 30 responded yes suggesting that these two age groups behave in a very similar way with perhaps younger investors looking more at the H-share market. It should be noted that the sample taken (63 interviewed) is rather small and hence difficult to extract solid (statistically reliable) conclusions. Nevertheless a sample of 63, while small, strongly indicates that overall mainland Chinese investors do not look at the H-share market when taking A-share investment decisions (dual listed)

2.6. Chapter conclusions

In this chapter a review of the Chinese demographics is performed. Given the high percentage of retail investors in the mainland market it seems necessary to have some knowledge of their demographics when analyzing the stock market. A survey among retail investors was performed. The results seem to indicate that mainland retail investors do not look at the performance of the H-share when making investment decision on A-shares (A-H dual listed stocks).

Another topic covered in this section is corporate governance. It has been argued by many analysts that Hong Kong has a better corporate governance as well as investors' protection law than mainland China. A review of legal reports covering this issue does seem to indicate that Hong Kong does have a better (or at least more western like) investors protection system. Perhaps the main point in this chapter is that owning the

A-share of a dual listed company is not strictly the same than owning the H-share of the same company (dual listed) at least from a legal point of view. The literature review seems to indicate that this apparent gap between the mainland and Hong Kong has considerably narrowed over the last few years. This chapter is a necessary foundation for the following chapter that are more quantitative and basically tries to answer the question of “what are we comparing?”.

Chapter 3. Trading Rules & Other Market Participants

3.1. Introduction

This chapter is a review of the trading rules and market regulations in the Hong Kong, Shanghai and Shenzhen stock exchanges, which is of considerable importance before doing any quantitative analysis. It seemed a necessary part of this dissertation to cover some of the structural differences such as trading hours, bank holidays and short selling regulations in the various markets. Perhaps, one of the main ideas behind this chapter is the concept that while the stocks of dual listed companies (A-share market and H-share market) could be considered theoretically identical they are not, as numerous differences in the markets create distortions in their values.

The Hong Kong and Mainland China markets have a large amount of differences which go well beyond the difference in compliance and regulatory systems discussed in the previous chapter, arguably supporting the idea that while technically the A-share and H-share of a dual listed company represent the same thing they are in practice not identical.

3.2. Literature review

[Zhenmin Fang] performed an interesting analysis in the impact of short-selling restrictions in mainland China for dual listed companies. In 2010 the mainland China regulator introduced new regulation allowing some degree of short selling of A-shares by domestic investors. It should be noted that international investors with QFII licenses continue not to be allowed to short A-shares. Several other restrictions are also in place. [Zhenmin Fang] concludes in his article that the restrictions on short-selling in A-shares help to create an upward bias in the A-share price of dual listed companies. Similar results were obtained by other authors such as [Liu].

[Chan] wrote another interesting article regarding the impact of short selling in A to H share spreads. [Chan] concluded that in a bearish market the price of shortable H-shares decrease more than the price of their A-share equivalents. [Chan] also found that the volume in this case (bearish market) is also higher for shortable shares.

The previously mentioned articles seem to support the idea that the different rules regarding short-selling in the mainland market and the H-share market can indeed impact share price as well as trading volumes.

There are many articles [Diamond], [Wang], [Saffi] defending the view that short-selling improves market efficiency. [Wang]'s article even goes a step further suggesting that in some situations the possibility of short selling a stock could be beneficial for the stock price. On the other hand, opponents of short selling believe that some short sellers try to manipulate stock prices [Misra] through short selling activities. [Brenner], who does not seem to oppose the concept of short-selling, does acknowledge the potential for market manipulation using this tool and support the idea that *"stocks should be borrowed by prior to a short sale by any investor who is not a market maker*". Such type of measure is typically considered to decrease speculative behavior.

Besides the difference in short selling rules, which make virtually impossible for a foreign investor to short an A-share company, there are other issues when trying to exploit the difference in price between dual listed companies for investment purposes. For instance, [Gwangheon] cited the issue of different trading hours as a potential impediment for successful trading strategies: "*market frictions, such as different trading hours and thin trading for some of our pairs might make the strategies not only risky, but impossible to implement*". The issue of time difference in trading hours is also mentioned by other authors such as [Abe] but very briefly and covering mostly European dual listed stocks. There are a few articles covering arbitrage opportunities

in Chinese stocks but most of those articles cover arbitrage between Hong Kong listed stocks (H-shares) and US listed. This is a very interesting article because it takes into account trading costs.

[Hing –Wah] concludes that the A-share market has better liquidity than the H-share market but the author also concludes that this relative illiquidity is not a major issue. The other major conclusion of this article is that "after controlling for traditional liquidity measures and variables related competing hypotheses, the percentage differences in quoted spread and depth between A-shares and H-shares still explain significantly the price premium".

A frequently mentioned topic mentioned in the literature differentiating foreign and domestic investors is the different level of information (domestic investors better informed than foreign investors). For instance, [Chakravarty] mentions that the A-B spread can be, at least partially, explained by this different level of information between the two type of investors.

Another important point covered in the literature is the concept of arbitrage. A very interesting article about the price relationship between dual listed Chinese stocks is the one written by [Peng] from the Hong Kong Monetary Authority. According to his study there is "*relative price convergence but no absolute price convergence*". [Peng]'s article founds that "*price differentials were stationary around an average A-share premium of 77%, from which a divergence would dissipate by one half in about 40 trading days*". One very interesting point that this article makes is the possibility of "illicit" arbitrage happening between the two markets. The authors do not elaborate in how this illicit arbitrage might be performed but it is not an unreasonable assumption that such arbitrage does indeed happen. Another issue is the size of this arbitrage i.e. is the capital deployed to do arbitrage enough to actually impact share prices?.

Nevertheless, there are many articles in the literature mentioning the complexities of the dual listed price differential of Chinese companies. For instance [Fernald] mentions that "Chinese stocks exhibits extreme violations of the law of one price" and hints that arbitrage does not work properly in the Chinese market. [Fernald] also found that in the analyzed period mainland stocks were more volatile than Hong Kong stocks.

3.3. Trading rules

Trading rules in the mainland and in Hong Kong are not the same with the Shanghai Stock Exchange, Shenzhen Stock Exchange and Hong Kong Stock Exchange having their own regulation

3.3.1. Shanghai Stock Exchange trading rules

According to article 3.4.13 of the circular "Trading Rules of Shanghai Stock Exchange" (May 15th 2006) if the share price increases or decreases above 10% the trading of such security will be stopped.

> *"The Exchange imposes the daily price limit on trading of stocks and mutual funds, with a daily price up/down limit of 10% for stocks and mutual funds and a daily price up/down limit of 5% for stocks under special treatment (ST shares or *ST shares).*
>
> *The price limit is calculated as follows: price limit = previous closing price × (1 ± price up/down limit percentage) .*
>
> *The calculation result shall be rounded to the tick size.*
>
> *The price limit does not apply to any of the following cases on the first trading day:*
>
> *(1) IPO shares or closed-end funds;*
>
> *(2) further issue;*
>
> *(3) shares whose listing is resumed after suspension; or*

(4) other cases as recognized by the Exchange.

The Exchange may adjust the daily price up/down limit upon the approval of the CSRC."

Source: Shanghai Stock Exchange

The Shanghai Stock Exchange and the Shenzhen Stock exchange are both supervised by the CSRC, which ensures consistency in rules and guidelines across mainland markets.

These trading rules have, obviously, a very strong impact on equity returns. [Dongwei Su] mentioned in his 1997 article that when "*A 5% limit was removed on May 22, 1992, which was followed by a doubling of the Shanghai A share index in one day*".

Trading Hours

Hong Kong trading hour are slightly different from mainland trading hours.

Table 6. Trading Hours

Auction Session – Hong Kong Stock Exchange		
Pre-opening session	9:00 am	9:30 am
Continuous trading session		
Morning session	9:30 am	12:00
Extended morning session	12:00	1:00 pm
Afternoon session	1:00 pm	4:00 pm

Source: Directly taken from Hong Kong Stock Exchange website (updated 02/03/2012)

Auction Session – Shanghai Stock Exchange		
Pre-opening session	9:15 am	9:25 am
Continuous trading session		
Morning session	9:30 am	11:30
Afternoon session	13:00 pm	15:00 pm

Source: Shanghai Stock Exchange

Auction Session – Shenzhen Stock Exchange		
Pre-opening session	9:15 am	9:25 am
Continuous trading session		
Morning session	9:30 am	11:30
Afternoon session	13:00 pm	14:57 pm

Source: Shenzhen Stock Exchange

The Hong Kong Stock Exchange has one hour more of trading in the afternoon session than the mainland exchanges. This could potential affect the return of the stocks assuming the possibility of information arriving in the last hour of trading in Hong Kong and investors reacting to such information before the closing time

3.3.2. Bank Holidays

Similarly, Hong Kong and the mainland have a slightly different holiday calendar.

Table 7. Bank holidays

Hong Kong -2012				Shanghai-2012		
Date	**Day**	**Holiday**		**Date**	**Day**	**Holiday**
Jan-2	Monday	The day following the first day of January		Jan-2	Monday	The day following the first day of January
Jan-23	Monday	Lunar New Year's Day		Jan-3	Tuesday	The day following the second day of January
Jan-24	Tuesday	The second Day of the Lunar New Year		Apr-2	Monday	Ching Ming Festival
Jan-25	Wednesday	The third day of the lunar New Year		Apr-3	Tuesday	Ching Ming Festival
Apr-4	Wednesday	Ching Ming Festival		Apr-4	Wednesday	Ching Ming Festival
Apr-6	Friday	Good Friday		Apr-30	Monday	Labor Day

Apr-9	Monday	Easter Monday		May-1	Tuesday	Labor Day
May-1	Tuesday	Labour Day		Jun-22	Friday	Tuen Ng Festival
Jul-2	Monday	The day following Hong Kong Special Administrative Establishment Day		Oct-1	Monday	Mid-Autumn Festival
Oct-1	Monday	The Day following the Chinese Mid-Autumn Festival		Oct-2	Tuesday	Mid-Autumn Festival
Oct-2	Tuesday	The day following National Day		Oct-3	Wednesday	Mid-Autumn Festival
Oct-23	Tuesday	Chung Yueng Festival		Oct-4	Thursday	Mid-Autumn Festival
Dec-25	Tuesday	Christmas Day		Oct-5	Friday	Mid-Autumn Festival
Dec-26	Wednesday	The first weekday after Christmas Day				

Source: Hong Kong data taken from Hong Kong Stock Exchange website. Shanghai Stock Exchange website

Hong Kong Stock Exchange is scheduled to halt trading 14 days in 2012 due to holidays. Shanghai Stock Exchange has roughly the same amount of banking holiday days (13) but many of these dates are not concurrent. There will be 9 days in 2012 in which the Hong Kong Stock Exchange is closed while the Shanghai Stock Exchange is opened due to scheduled bank holidays. Similarly, there will be 8 days in which the Shanghai Stock Exchange will be closed while the Hong Kong Stock Exchange closed.

3.3.3. Typhoons in Hong Kong

Another important aspect is the impact of typhoons and tropical storms in Hong Kong. Hong Kong is hit with relative frequency by typhoons. This is a much rarer event in

Shanghai. Due to safety concerns the Hong Kong Stock Exchange has strict rules and procedures in the case of typhoon. The Hong Kong authorities (Hong Kong Observatory) issue formal typhoon alerts "tropical cyclone warning signals". These warning signals follow a numerical code depending on the intensity of the cyclone or tropical storm. In the event of a cyclone of substantial intensity work is suspended. For instance, if a Typhoon Signal N.8 is issued trading should be halt (the actual time of the halting depends on the time of the issuance of the signal).

As an example, Typhoon Nesat forced the suspension of trading in Hong Kong in September 29th, 2011, Shanghai trading was not affected by the typhoon.

3.3.4 Short selling in Hong Kong

One of the key differences between the Hong Kong market and the mainland market (for QFII) is short selling. Short selling is not allowed in the mainland (QFII) while it is allowed (with restrictions) in Hong Kong. This makes an arbitrage strategy between both markets not feasible. "Naked" short selling is not allow in Hong Kong, since the introduction of short selling in this market such practice has never being legal. Articles 8, 9 and 10 of the sixth schedule of the "securities borrowing and lending regulations" published by the Hong Kong Stock Exchange defines the requirements for short selling and its clear collateral requirements (please see below).

> (*8) A borrower shall provide collateral for its borrowing. The collateral shall be in a readily realizable form and acceptable to the lender.*
>
> *(9)*
>
> *(a) The amount of collateral provided shall at all times be not less than 100% of the current market value of the borrowed securities. Where the securities borrowing is for the purposes of a short sale (as defined in the Eleventh Schedule to the Rules), the amount of collateral deposited by the*

borrower shall at all times be not less than 105% of the current market value of the relevant uncovered securities borrowing position.

(b) Where an Exchange Participant maintains uncovered securities borrowing positions on its own account or for its clients, it shall mark to market (at least daily) such uncovered securities borrowing positions and shall further maintain the level of the collateral stipulated in Regulation (9)(a) above.

In marking to market, an Exchange Participant shall when:-

(i) *marking to market only once daily, mark against the closing price of the relevant security on the previous trading day as published by the Exchange; or*

(ii) *marking to market two or more times daily, mark on at least the first occasion, against the closing price of the relevant security on the previous trading day as published by the Exchange.*

(iii)

(10) In the event that at all times the value of the collateral becomes less than 100% or 105% where the securities borrowing is in relation to a short sale (or such higher percentage as agreed between the borrower and the lender) of the current market value of the borrowed securities, the lender shall at least daily require the borrower to increase the amount of collateral to 100% or 105% where the securities borrowing is in relation to a short sale (or such higher percentage as may have been agreed upon).

(11) In the event the collateral becomes greater in value than 100% or 105% where the securities borrowing is in relation to a short sale (or such higher

> *percentage as agreed between the borrower and the lender) of the current market value of the borrowed securities, the borrower may require the lender to release collateral which is in excess of 100%, or 105% where the securities borrowing is in relation to a short sale or such percentage which has been agreed upon.*
>
> (Source: Hong Kong Stock Exchange)

3.3.5. Trading costs

Trading costs are another important factor. Given the different regulations and the different type of players, such as investors and brokerage houses, trading costs are not the same in the mainland and in Hong Kong. Trading costs could be roughly divided into two types: 1) commercial and 2) regulatory costs.

Commercial costs are basically related to the cost incurred by the investor to acquire or dispose of securities from a brokerage house. This is typically in the form of a commission fee that the investor pays when buying or selling securities. Commission fees vary greatly and are not public information. Factors such as the expected trading volume or reputation of the investor can have an effect on the commission rate offered to the investor by the brokerage house. The term commercial refers to the fact that this rate (commission rate) is negotiable between the investor and the brokerage house.

Regulatory costs are those costs that are set by the regulator and related authorities. These costs are clearly not negotiable. These costs are different in Hong Kong and in the mainland.

3.3.6. Closing price

The daily closing price of companies traded in the Hong Kong Stock exchange are calculated by taken the median of five prices in the last minute of trading in the afternoon session. The closing price is calculated in a slightly different way in the

Shanghai Stock Exchange "*trading volume-weighted average price of all the trades of such security during the one minute before the last trade (including the last trade) on that day*" [SSE]. This could lead to difference in prices.

3.3.7. Recap of main differences

This article identifies 21 main topics that can potentially affect the difference in price of dual listed companies:

1) Difference legal system (claim on assets)
2) Difference investor base (retail vs institutional)
3) Liquidity
4) Regulation
5) Trading cost
6) Trading hours
7) Bank holidays
8) Trading up/down limits
9) Short selling
10) Foreign exchange effect
11) Central bank intervention
12) Language (Mandarin vs Cantonese)
13) Access/speed of information
14) Different dividends
15) Inflation expectations
16) Different investor overall economic outlook
17) Level of financial education of investors (retail)
18) Predominant trading styles
19) Investment horizons
20) Closing price calculation
21) Settlement

While there is a certain amount of convergence within the two markets the previously stated topics are likely to continue to affect the difference in price of dual listed companies.

3.4. Credit Rating Agencies

Internationally there are three dominant credit rating agencies: S&P, Moody's and Fitch. In China the situation is rather different. International credit rating agencies can only access the market through joint ventures with local companies. For instance Moody's has a joint venture with China Chengxin International. Despite extensive lobbying by the main credit agencies the restrictions in this area remain in place. As an example of the initiatives to change the current rules taken by the main international credit rating agencies is the testimony of Vickie A. Tillman (from S&P) before the US senate:

> *"...effectively create a framework that makes it very difficult for international credit ratings agencies to enter the market and provide the kind of service that the market needs.*
> *...we respectfully ask this Commission's further assistance in making known our position to Chinese authorities.*
> *Among the most burdensome of the proposed regulations are 1) the requirement that foreign ratings be limited to entering the market only through a joint venture with a licensed local Chinese credit rating agency in which foreign credit rating agencies are limited to no more than 49% of ownership: (Articles 6 and 9); and 2) abundant restrictions on how foreign rating agencies conduct their rating processes, the most egregious of which would be the need to register rating committee members in the CBRC."*

Source: US Senate record

In practice, for a quantitative point of view, the relevance of credit rating in China in

relation with stocks returns has been putted into question by several articles such as [Winnie P.H Poon] or [Bottelier]. Poon also mentions [Kenedy] work saying that:

> *"these domestic rating agencies have no apparent impact on the decisions of corporate bond buyers in China and the market attaches little credibility to their ratings"*

As there is abundant literature arguing against a relation between securities prices and credit rating, this analysis was not performed.

3.5 Legal considerations regarding Chinese company/securities law. Are A-shares, B-shares and H-shares really equivalent?

For instance, key element that needs to be understood is that China company and securities laws (in a western sense) are quite recent. The first Chinese company law was promulgated [Gu Minkang] in 1995 [People's Republic of China on Company Law -1993] and materially reviewed/modified in 2005 [Company Law -2005]. This lack of experience results in a law that is not as robust as in other jurisdictions [Gu Minkang]**.** One of the issues mentioned by this author is that it is unclear how the different types of shareholders can exercise their rights "unfortunately, the Chinese company law does not indicate how the holders of A (A-shares), B (B-shares) and H (H-shares) and other stock classes may exercise what rights".

3.5.1 Take over possibility

One important issue when analyzing the equivalence of these securities is the "take over" capabilities of these securities. In other words, can an international investor take over (majority stake) in a Chinese company by purchasing these securities. [Gu Minkang] mentioned in his book two historical cases: (1) Jiangling Motors and (2) Beijing Light Bus. Foreign investors took substantial equity stakes in these companies through the purchase of B-shares. Ford Motor purchased in 1995 a large stake on

Jianling Motors. Jianling Motors B-share offering was mainly purchased by Ford Motors, which makes this transaction an unusual public offering. Similarly, Isuzu Motors (Japan) and Itochu Trading Company (Japan) purchased substantial stakes in Beijing Light Bus. All of these transactions had the required regulatory approvals. On the other hand, current A-share regulations for foreign investors preclude such option. A qualified international investor (A-share) cannot exceed a maximum of 10% ownership in any company. Furthermore, this 10% limit is calculated over the entire securities holdings including A-shares, B-shares, H-shares and other equity securities (regardless of the place of issuance). From this point of view, a QFII license would be detrimental to a company which intends to purchase large equity stakes on individual companies.

3.6. State Owned Asset Supervision and Administration Commission of the State Council (SASAC)

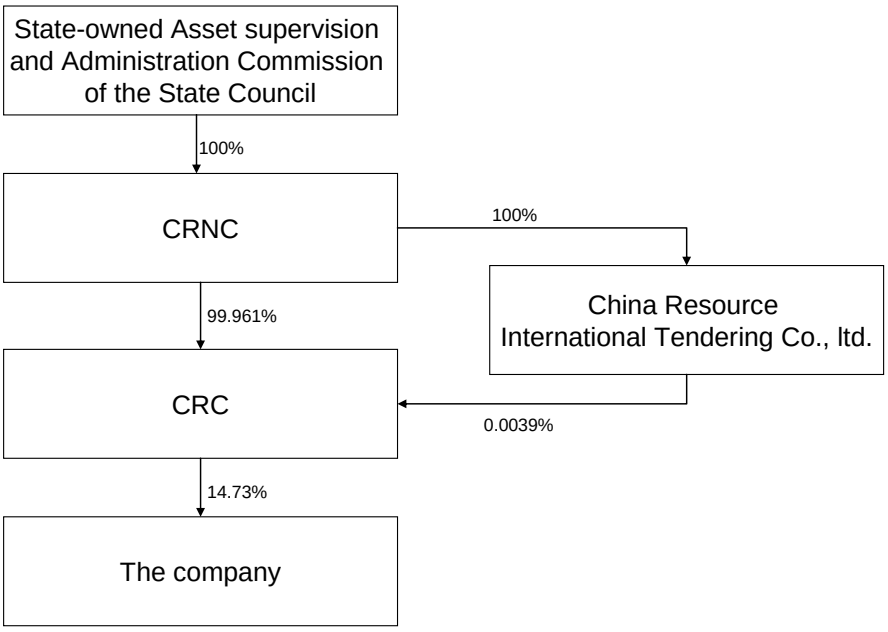
The State-owned Asset Supervision and Administration Commission of the State Council (SASAC) is an important player in the Chinese capital market. It directly invests in companies and it is a long term investor. It reports directly to the State Council. SASAC importance in the Chinese capital markets cannot be underestimated. According to their own definition:

> "*SASAC shoulders the responsibility of supervising the preservation and increment of the value of the state-owned assets of the supervised enterprises; establishes and improves the index system of the preservation and increment of the value of the state-owned assets, and works out assessment criteria; supervises and administers the preservation and increment of the value of the state-owned assets of the supervised enterprises through statistics and auditing; and is responsible for the management work of wages and remuneration of the supervised enterprises and formulates policies regulating the income distribution of the top executives of the supervised enterprises and organizes implementation of the policie*s".

SASAC appoints (and fires) the top management of state-owned enterprises and can even take further actions (besides removing) against management that has committed some type of disciplinary violation.

SASAC owns 100% of China Resources National Corporation that through other corporation invests in Chinese companies. For instance, it is the largest shareholder of China Vanke (000002) which is the largest property developer in China. China Vanke is a dual listed company (A-share and B-share market) with a market capitalization of RMB 98 billion (approximately USD 15.1 billion) as of June 2012. SASAC.

Figure 7. SASAC



Source: taken from the 2011 China Vanke annual report

This type of equity arrangement is common in China and is likely to have an impact on the price of the stock (typically, but not always, the state invests in the A-share market rather than in the B or H share markets).

Table 8. Vanke

Top 10 China Vanke shareholders (as of end of 2011)		
China Resources Co., Limited ("CRC")	14.73%	A-share
E Fund Shenzhen Stock Exchange 100 Exchange-Traded fund	1.23%	A-share
Liu Yuansheng	1.22%	A-share
China Life Insurance Company Limited – Dividend Distribution – Individual Dividend-005L-FH002 Shen	1.18%	A-share
Bosera Theme Industry Stock Securities Investment Fund	1.13%	A-share
Rongtong Shenzhen Stock Exchange 100 Index Securities Investment Fund	0.85%	A-share
National Social Security Fund – portfolio 103	0.74%	A-share
HTHK/CMG FSGUFP_CMG FIRST STATE CHINA	0.71%	B-share
Bosera Value Growth Securities Investment Fund	0.68%	A-share
UBS AG	0.68%	A-share

Source: taken from the 2011 China Vanke annual report

3.7. Dividends

One factor that should be understood when analyzing equity returns is the impact of dividends. One of the hot topics, according to the World Bank in the Chinese capital markets is dividends paid by state-owned enterprises (SOE). SOEs are among the largest and more profitable corporations in China. This type of corporations pays low dividends when compared to its private/overseas counterparties. Until 2007 they were except of paying any dividends. In 2007 new legislation was approved forcing some SOE to pay dividends. This regulation required that profitable large SOE should pay a 10% dividend and the rest a 5%. Some industries that were considered strategic, such as the defense industry, were excluded from this new regulation i.e., not required to pay any dividend. In 2012 a further wave or regulation was introduced, basically increasing the dividend requirement by 5% in all of the three classes of SOE (profitable, non or barely profitable and strategic). Therefore profitable SOE are required to pay now a 15% dividend, non or barely profitable are required to pay 10% and the previously except strategic sector is now required to pay 5%.

While these companies for a long time did not pay a dividend in the mainland they conformed to "standard practices" [World Bank] in other markets such as Hong Kong. Having different dividends in dual listed companies is clearly an extra complication when analyzing returns defined in the classical way (including dividends).

SOE dividends are so important because this type of company is perhaps the most stable in the market (because of the backing of the government) and increasingly account for a large share of the national Chinese GDP.

Table 9 – World Bank estimates of SOEs (non-financial) profit in China

Year	*Profit of non-financial SOE*	
	RMB billion	*% of GDP*
1998	*21.3*	*0.3*
1999	*114.5*	*1.3*
2000	*283.4*	*2.9*
2001	*281.1*	*2.6*
2002	*378.6*	*3.1*
2003	*476.9*	*3.5*
2004	*736.9*	*4.6*
2005	*958.0*	*5.2*
2006	*1219.4*	*5.8*
2007	*1744.2*	*7.0*

Source: This table was directly taken from a World Bank report, which mentioned the following sources: Ministry of Finance, Financial Yearbook of China 2008, national Bureau of Statistics, China Statistical Yearbook 2008.

3.8. Chapter conclusions

In chapter 3 a review of the technical differences between trading in the mainland and in Hong Kong was performed. It is important to understand that there are some technical factors, such as different opening hours or different bank holidays that can impact prices in one exchange but not the other. There are also other more exotic events such as typhoons that can, and do, halt trading in one exchange and not the other. Typhoons hit Hong Kong with relatively frequency. For example, trading was

halted due to typhoons in Hong Kong over the last couple of years several times. Hong Kong has a very well structured system of weather alarms and compulsory market closures in place. Clearly this type of event could make Hong Kong investors unable to react to a market development in the mainland (obviously impacting stock spreads). Another thing to consider is limitations on short selling. Short selling is allowed for most Hong Kong listed companies but foreign investors accessing the A-share market through the QFII or RQFII program are not allowed to short A-shares. This makes an arbitrage strategy extremely difficult in real terms. Very recently (early 2013) the Chinese authorities introduced an initiative allowing foreign investors to use index futures (on the CSI 300 index) through the QFII program. QFII investors are now able to short the CSI 300 and hence hedge their positions. Two things should be noted: 1) shorting at a company level remains forbidden for QFIIs and 2) shorting the CSI 300 index is only allowed for hedging purposes (the current regulation does not allow for arbitrage strategies).

Trading costs are also different between the Hong Kong and mainland exchanges. Another factor to take into account is the strong limitations on daily movements in the mainland markets. Share price cannot go up or down more than 10% for the closure price in the previous day. When the share price increases by 10% of decreases by 10% trading in the company is halted (this is commonly called in the industry a “limit up” event).

Chapter 4. Quantitative analysis of the market

4.1. Introduction

Now that we have a foundation about the major characteristics of dual listed companies a quantitative analysis of such stocks was performed. A practitioner needs a complete understanding of both the more qualitative and the more quantitative properties of dual listed stocks in order to maximize his/her chances to profitably trade those stocks. Some of the major conclusions in this chapter are:

1) Returns of Chinese stocks are not normally distributed. This analysis holds not only for dual listed companies but for all Chinese companies (all listed Chinese companies were analyzed).
2) There is no strong linear correlation among the A-share and H-share of Chinese dual listed companies. This clearly does not imply that there is not some kind of relationship between H-share and A-share returns of dual listed companies. It only means that this relationship is not linear.
3) There is no statistically significant difference between investing in the A-share or the H-share of a dual listed Chinese companies if hold for a relatively long period (12 months).
4) While the A-share market tends to be more volatile than the H-share market for dual listed companies the assumption does not hold true for any given long period of time (12 months).
5) The introduction of the QFII program did not have any statistically significant impact in the behaviour of dual listed companies.
6) The A-share market does not always react on a more volatile way to “market events” such as profit warnings than the H-share market (dual listed companies).
7) The analysis seems to differentiate between two types of dual listed Chinese companies. Basically representing the large state-owned Chinese banks and

related companies in one sector and all the other companies in another sector. Further analysis of this result was performed in Chapter 5.

8) A factor model analysis of dual listed companies including some of the major economic indicators such as CPI, CPI (food only), SHIBOR, M2, gross output value of industry, consumer confidence, effective policy rate, export price, import price and PMI, with four components seems to work nicely for dual listed Chinese stocks with components that seem to have interpretable meanings.
9) Efficient frontiers were calculated for both the A-share (portfolio) and the H-share portfolio. The efficient frontiers look rather different in the case of the A-share and H-share dual listed stocks (portfolio weights for similar risk levels).
10) Successful trading strategies between the H-share and A-share market are difficult, and would likely require considerable market knowledge as dual listed stocks move, on average, in the same direction only 65% of the days.

As previously mentioned a principal components analysis was performed in this chapter. This analysis was performed for each individual company (dual listed). The objective behind performing a principal component analysis of macroeconomic variables and stock spread is having a greater quantitative understanding of how the macro environment affects the relative performance (spread) of dual listed companies. I could not find any article in the literature performing such analysis. The results were encouraging and clearly discriminate between "important' variables such as CPI and less important ones such as "new buildings". Given the massive amount of data available for the practitioner it is important to have a framework to filter the information that has a major impact on investment returns. This is useful for investors tying to hedge their investment (particularly in arbitrage situations). It can be also used for investors trying to make a directional investment i.e. trying to forecast which security (between A-share and H-share) will outperform according to their own

forecast on macro variables as well as having a quantitative sense of the impact on changes of those variables in spreads. This type of analysis is arguably more useful for a practitioner at a company level than at an index level.

The principal component analysis includes, besides the spread of dual listed stocks, the following economic macro variables: CPI, CPI (food only), SHIBOR 3M5, M2, Gross output value of industry, consumer confidence, effective policy rate, export price, import price and PMI. The results are rather satisfactory with the extraction value for the variable "Stock Spread" having a value in most cases above 0.82. The analysis seems to indicate that CPI is positively related to stock spreads in the period analyze. Similarly import and export figures seem to be also positively related. The data indicates that there is little difference between using CPI (total figure) or CPI (food only). This is an interesting result because most market participants track the CPI food figure very closely. Guaranteeing affordable food, particularly on basic food products such as rice and pork, has been a long term objective of the Chinese government. The rationale is rather simple, is food becomes unaffordable (or even if consumers perceive that food prices are unreasonable) then there could be social unrest. Avoiding social unrest is one of the major objectives of the current and previous governments.

What follows is a description of the major economic indicators used in the PCA analysis.

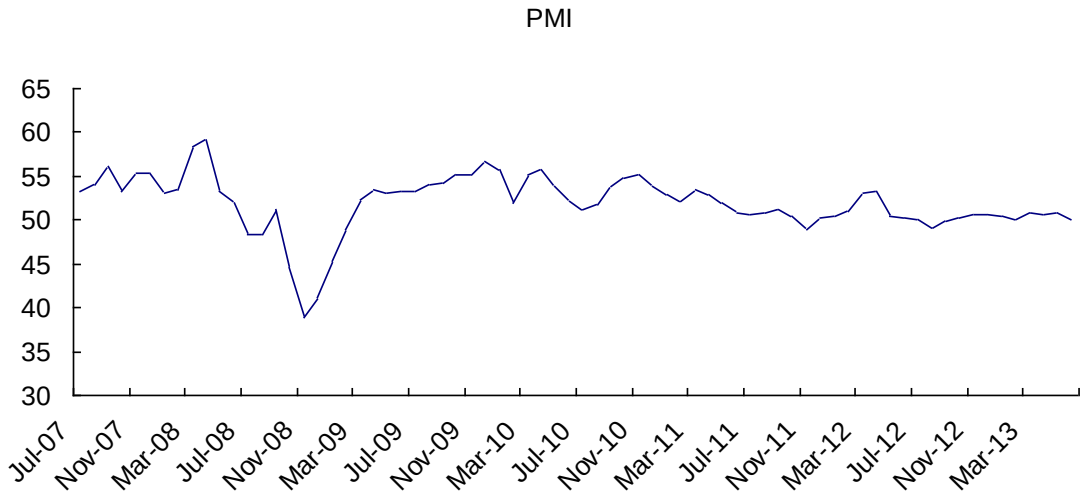
PMI

China Manufacturing PMI is one of the major indicators followed by market participants. A reading above 50 indicates that the manufacturing sector is expending while a read below 50 indicates a contraction. The data is collected by the Federation of Logistics & Purchasing and published by the National Bureau of Statics. The PMI has five components with the following weights:

1) New Orders (30%)
2) Output (25%)
3) Employment (20%)
4) Supplier delivery times (15%)
5) Inventories (10%)

(Source: National Bureau of Statistics, Bloomberg)

The PMI figure is released monthly.



Source: Bloomberg

New Buildings

It seemed reasonable to introduce a variable related to the real estate and the variable chosen was "start of new buildings". This data is published monthly by the National Bureau of Statistics and, as it names indicates, is the amount of new residential buildings that have just started to be built. This indicator does not include commercial or industrial properties.

SHIBOR

SHIBOR is the Chinese equivalent of LIBOR and represents the rate at which banks can borrow from each other in the interbank market. Typically a low SHIBOR rate is

associated with a high level of trust among bank as well as low perceived risk. The rate used in this analysis is the 5-day average of the 3 months SHIBOR rate (rate for borrowing for a period of three months). This rate is quoted on an intraday basis but the actual amount used in this analysis is the end of day rate.

M2

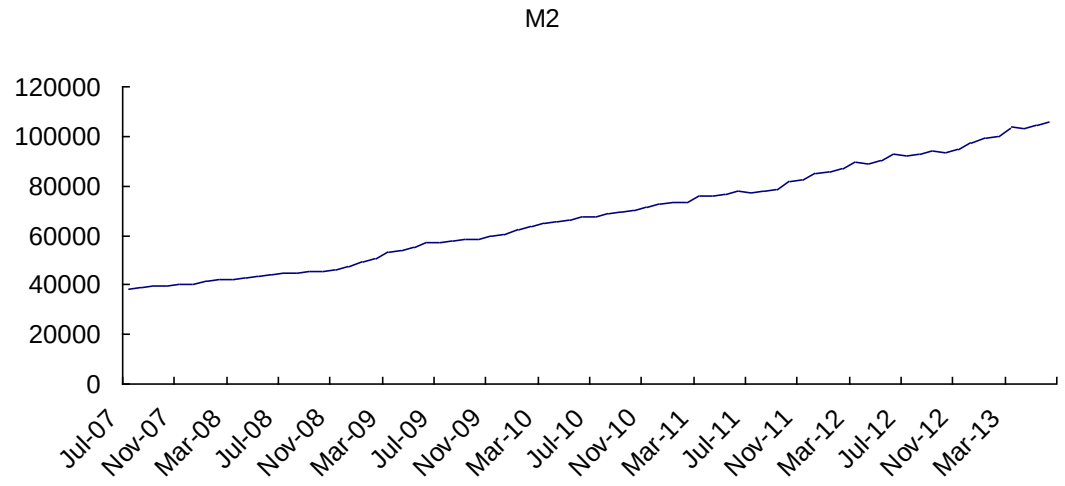
M2 is the broad measure of money supply (monthly). M2 includes M1 and M0 plus quasi money and it is released by the People's Bank of China

M0: cash in circulation

M1: M0 plus current enterprise deposits

M2: M1 plus fixed enterprise deposits plus household saving deposits

(Source: PBoC, KingsE)

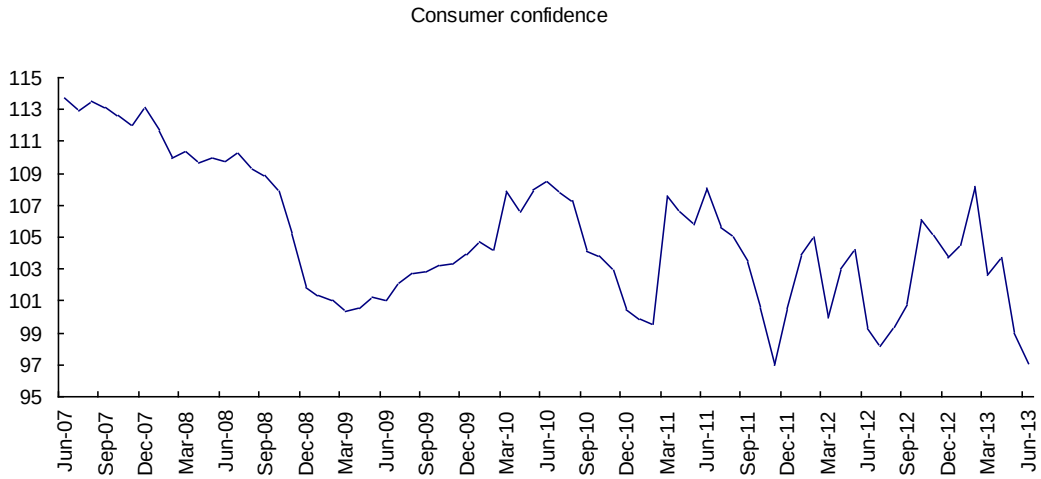


Source: Bloomberg

China Consumer Confidence

China's consumer confidence index tries to give a quantitative picture of the level of consumer confidence on a monthly basis. It is mentioned by some market participants that the Chinese stock market performance is dictated by the perception of the Chinese middle class on the economic situation (retail investors represent a considerable fraction of the overall stock market) and hence it seemed reasonable to induce some quantitative indicator related to consumers' sentiment. The index is

released monthly by the National Bureau of Statistics.



Source: Bloomberg

Industrial Growth Output Value

Clearly one of the data that deserves some analysis is the industrial output of China. The data was released monthly by the National Bureau of statistics but it was recently discontinued. The process of industrialization in China is arguably one of the largest economic developments of the last few decades.

Interestingly, "Buildings Started" seems to be an irrelevant variable. This variable was included in the principal components analysis because the real estate sector is of great importance for the Chinese economy and has in recent years been the center of attention of many investors. Fear of a property bubble in China has forced the government to introduce severe policies to tackle property prices. It has been observed in recent years a peculiar trading pattern in which when strong property sales figures are released (particularly related to price increases) the stock market reacts with a correction as investors anticipate, or at least perceive, a greater risk of further tightening policies to be introduced in the sector.

The analysis also seems to indicate that a four-factor model is rather superior to a three-factor model for most of the companies analyzed with a five-factor model

adding relatively less additional benefit to the analysis. Hence, a four-factor model seems sufficient.

CPI

Consumer Price Index (CPI) is one of the most widely use indicators of inflation. In China the following components are included in the CPI (National Bureau of Statistics):

1) Food
    a. Grain
    b. Grease
    c. Meat
        i. Pork
        ii. Beef
        iii. Mutton
    d. Eggs
    e. Aquatic products
    f. Fresh vegetables
    g. Fresh fruits
    h. Milk and dairy products
2) Tobacco and liquor
    a. Tobacco
    b. Liquor
3) Clothing
    a. Clothing
    b. Shoes
4) Household facilities, articles and maintenance service
    a. Durable consumer
    b. Household services and processing
5) Health care and personal articles

   a. Chinese herbal medicine and proprietary Chinese medicine
   b. Western medicine
   c. Health care services

6) Transportation and communication
   a. Transportation facilities
   b. Fuels and parts for vehicles
   c. Communication facilities
   d. Communication services

7) Recreation, education and culture activities
   a. Education services
   b. Tourism

8) Residence
   a. Building and its decoration materials
   b. House renting
   c. Water, electricity and fuel

(Source: directly taken from the National Bureau of Statistics)

CPI Food

CPI Food is just the food component of the CPI. In China, market participants tend to consider CPI food as an important indicator. Maintaining price stability, particularly on essential items such as food has been one of priority target for the Chinese authorities (as it relates to social stability).

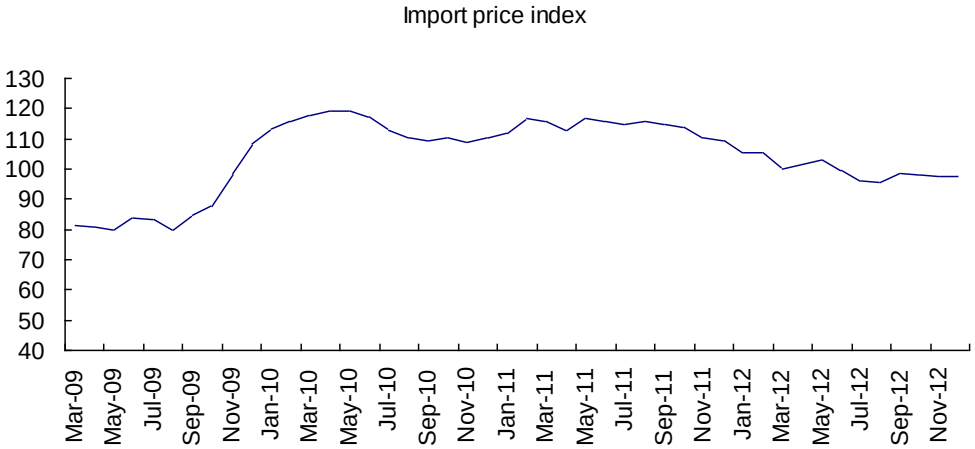
Effective policy rate

Effective policy rate can be defined as "best lending rates for various tenors determined by People's Bank of China" (Source: Bloomberg). In this case the one year tenor was selected.

Import and export prices

Import and export prices refer to the Customs General Administration of the PRC indexes on import and export prices (total). The data is released on a monthly basis.

Source: Bloomberg, the Customs General Administration of the PRC



Source: Bloomberg, the Customs General Administration of the PRC

The impact of foreign exchange (CNY and HKD) into Chinese dual listed stocks is also covered in this chapter. The role of foreign exchange in the values of dual listed Chinese companies is not one of the core topics of this dissertation but it is necessary to cover the fundamentals of these two currencies, such as pegs to the USD and trading bands, to have a better understanding of the behavior of dual listed companies.

4.2. Literature review

There are some interesting articles about the impact of exchange rate fluctuations in the A-H spread. For instance [Fung]'s article reaches several interesting conclusions such as that the introduction of a more flexible exchange rate in China had little impact in the A-H spread. According to [Fung]'s work "asymmetric information can explain 17% of variation for the fall of the H-share discount before reform". This article also mentioned that the spread might be reduced as there is an expectation of RMB appreciation. According to [Fung]'s article the spread is materially impacted by several other factors such as "domestic speculative behaviors" or "liquidity proxies".

Another interesting article covering the impact of foreign exchange in dual listed Chinese stocks is the one written by [Min Ye]. According to this article "dual listed Chinese firms are highly exposed to the RMB exchange rate movements". Perhaps one of the most interesting findings in this article is that stocks prices of dual listed (A and H shares) have different responses to changes in magnitude and direction. "Dual listed H-shares generally have higher exchange rate sensitivities than their counterpart". In this article it is also mentioned the impact of hot money into the Chinese economy as a possible reason for price distortions.

[Arquette] concludes that for the period between 1998 and 2006 the price difference in dual listed Chinese companies (listed in the mainland and Hong Kong or US) were largely influenced by "*exchange rate movements and investor perception*". According to [Arquette] calculations the exchange rate accounts for approximately 40% of the variation. Market sentiment (investor perception) seems to be, according to [Arqette] article, the other major factor governing the differential between dual listed stocks in their domestic market and overseas.

4.3. Beta Comparison

Betas for 57 dual listed companies were obtained from Bloomberg. The natural index for each stock was used i.e., Shanghai Composite Index for Shanghai traded stocks or Hong Kong Stock Index for Hong Kong traded stocks. Clearly these two indexes have different components but they are heavily correlated.

Surprisingly, the data seems to indicate that the Hong Kong stocks tend to react more vigorously to changes in the overall market. Of the 57 companies analyzed 38 had betas higher than 1 in the Hong Kong Stock Exchanges compared to only 24 in the mainland exchanges. A complete list of the betas can be found in Appendix 2.

Myers defines beta as:

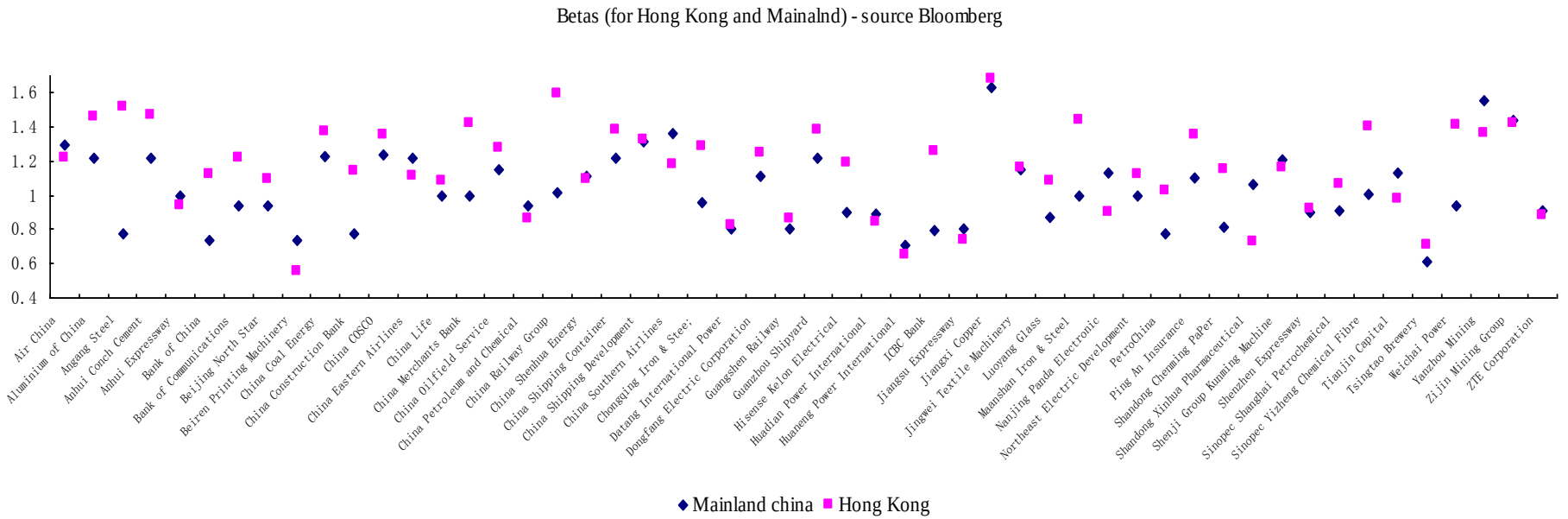
$$\beta_i = \sigma_{im} / \sigma^2_{2m}$$

"Where sigma m is the covariance between stock I's return and the market return and sigma^2m is the variance of the market return" (Myers). Beta is one of the key elements of the Capital Asset Pricing Model (CAPM). According to CAPM the expected returns on an asset are:

$$\text{Expected return} = \text{risk free rate} + \beta * \text{risk premium}$$

As previously mentioned a stock with a beta of 1 will move in line with the market. A stock with a beta less than one (but positive) will also move in line with the market but to a lesser degree. In other words, beta is also an indicator of how risky a company is.

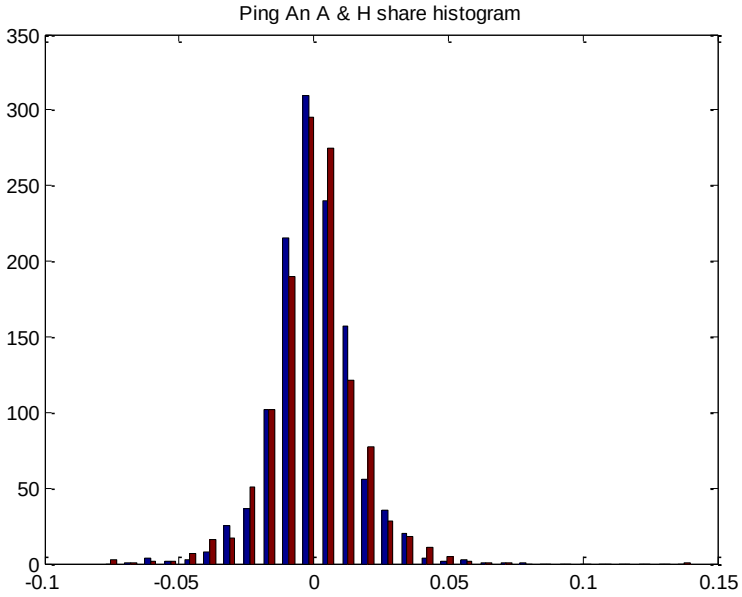
Figure 8 – Betas for dual listed Chinese companies (Bloomberg)

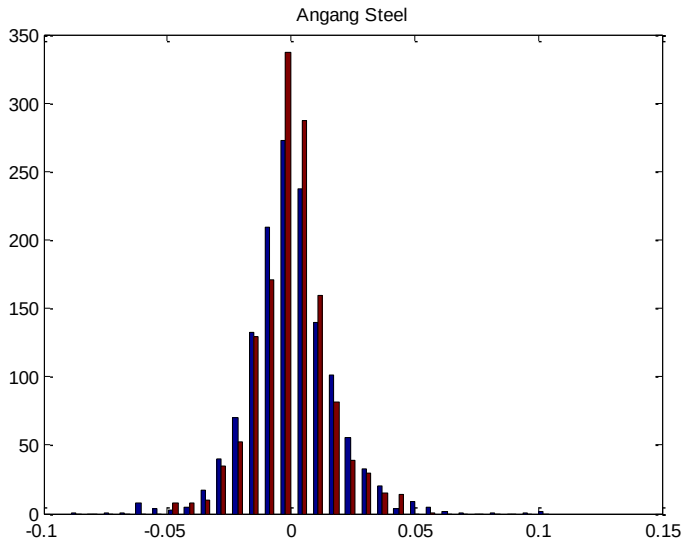


4.4. Lognormal distribution

The lognormal returns of both the H-shares security as well as the A-share security tend to be assumed to be well represented by a normal distribution. This is a common assumption in many financial analyses. We will show later that the normal distribution of log normal returns while looking as a reasonable assumption, an graphically correct, does not satisfy quantitative test such as the Kolmogorov test or the Lilli test.

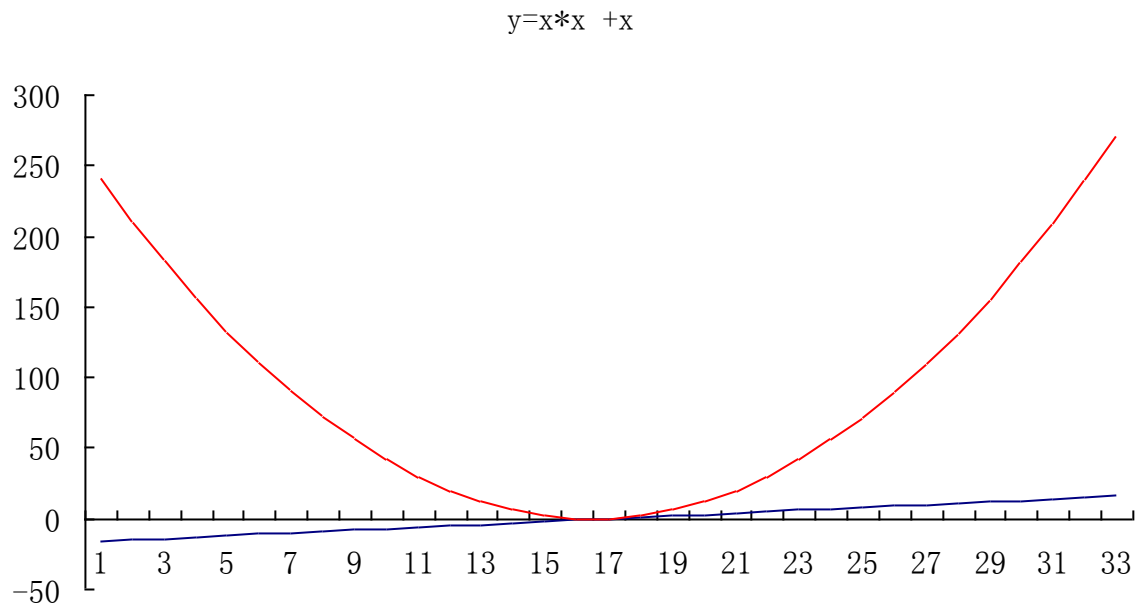
Figure 9 –histograms





4.5. Liner relationship

As a preliminary step, the linear correlations between all the analyzed stocks were computed (for both the H-shares as well as the A-shares securities). Clearly there can with a strong relationship between two variables while having a low correlation. For instance, the correlation between two variables {x,y} that follow the relationship y=x*x+x for x between [-16,16] is 0.117, which is a low value. However, it is obvious that there is a strong relationship between these two set of numbers.



As a first step, the standard deviations (for both the Hong Kong and Shanghai/Shenzhen stocks) as well as the linear correlations between them were calculated (Table 10).

Table 10
Volatility and correlation

	Standard deviation (HK) - in RMB	Standard deviation (Mainland) - in RMB	Linear correlation
Luoyang Glass	0.013	0.009	0.586
Jinwei Glass	0.018	0.013	0.618
Jiangxi Copper	0.015	0.011	0.534
Jiangsu Expressway	0.010	0.006	0.327
ICBC	0.010	0.005	0.411
Huanneng	0.009	0.008	0.346
Hudian Power	0.010	0.009	0.470
Guangzhou Shipyard	0.012	0.012	0.464
Guangzhou Pharma	0.015	0.014	0.568
Guansheng International	0.008	0.007	0.401
Dongfang international	0.015	0.010	0.469
Datang International	0.011	0.008	0.367
Chonqing International	0.012	0.009	0.438
China Southern Airlines	0.015	0.010	0.309
China Shipping Development	0.014	0.008	0.397
China Shipping Container	0.016	0.008	0.311
China Shenhua	0.010	0.009	0.549
China Railway	0.016	0.007	0.426
China Petroleum	0.009	0.006	0.452
China Oilfield	0.013	0.013	0.317
China Merchants	0.012	0.006	0.549
China Life	0.011	0.007	0.596
China Eastern Airlines	0.014	0.010	0.484
China Cosco	0.015	0.008	0.487
China Construction Bank	0.008	0.005	0.390

Zijin Mining	0.014	0.009	0.535
China coal energy	0.013	0.008	0.434
CITIC	0.010	0.004	0.491
Yanzhou Mining	0.014	0.012	0.383
Weichai Power	0.013	0.010	0.494
Tsingtao Brewery	0.009	0.007	0.419
Tianjin Capital	0.009	0.010	0.602
Sinopec Yizheng Chemical Fiber	0.015	0.010	0.463
Sinopec Shanghai	0.014	0.009	0.425
Shenzhen Expressway	0.010	0.008	0.332
Shenjin Group	0.013	0.012	0.458
Shandong Chenming	0.011	0.008	0.411
Shandong Pharmaceutical	0.009	0.008	0.448
Northeast Electric Development	0.014	0.009	0.498
Beijing North Star	0.010	0.007	0.331
Bank of Communications	0.010	0.005	0.473
Bank of China	0.009	0.004	0.490
Anhui highway	0.011	0.007	0.176
Angang Seel	0.016	0.007	0.012
Aluminum of China	0.013	0.009	0.498
Anhui Conch	0.016	0.012	0.641
PetroChina	0.009	0.005	0.472
Ping An	0.013	0.009	0.690

From 2010-12-06 to 2011-12-06

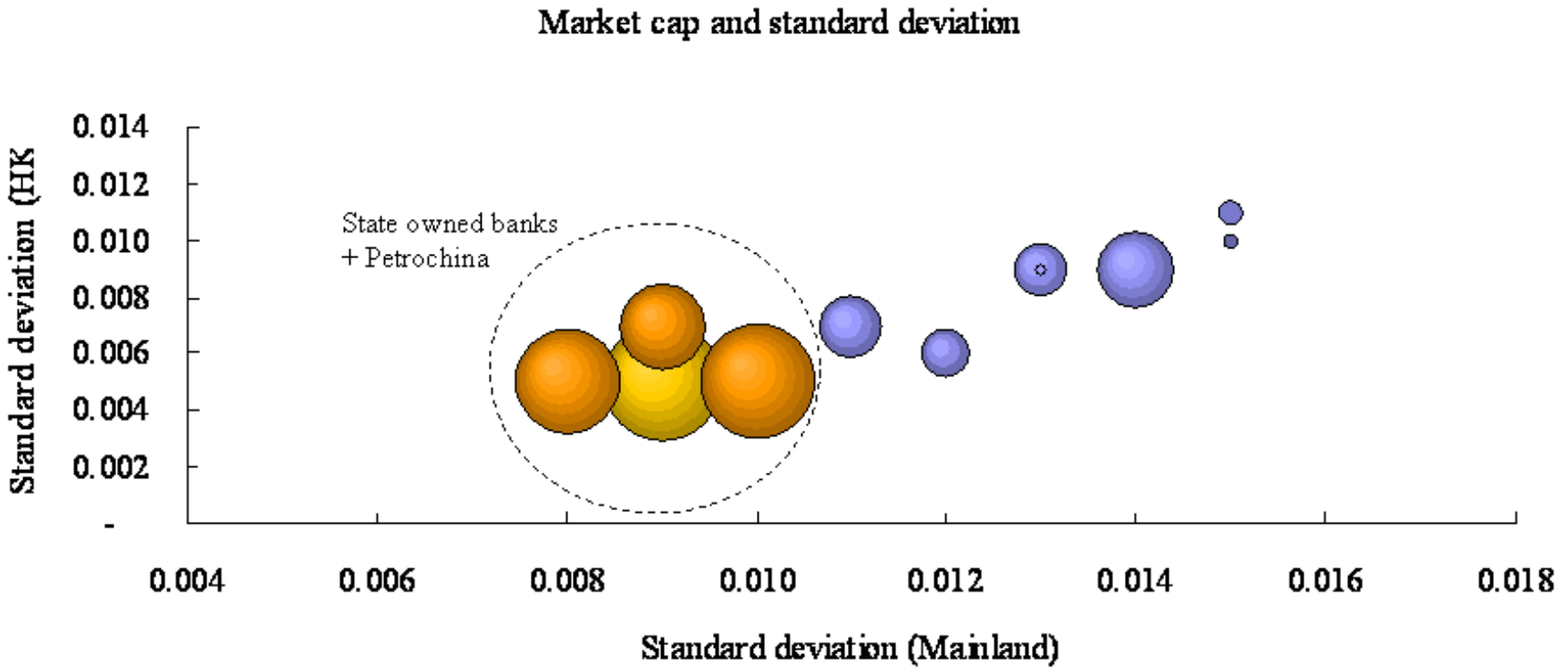
4.6 Large State-owned companies

When analyzing Chinese dual listed companies one of the first things that seems obvious is that some of the large state-owned companies and the rest of the companies seem to have different behavior. In the following figures (10, 11 and 12) a plot of the standard deviation in the Hong Kong market (Y-axis) and standard deviation in the mainland market (x-axis) is presented. The diagram is presented in the form of a bubble diagram with the size of the

bubble indicating the market capitalization of the company. In the first figure the total market capitalization (A-share and H-share) is presented. In the second figure the size of the bubble represents the market capitalization in the Hong Kong market only while in the last figure the size of the bubble represents the capitalization of the A-share market only. A color code was also introduced with orange representing the big-four state-owned banks, yellow is PetroChina and blue are all the other companies.

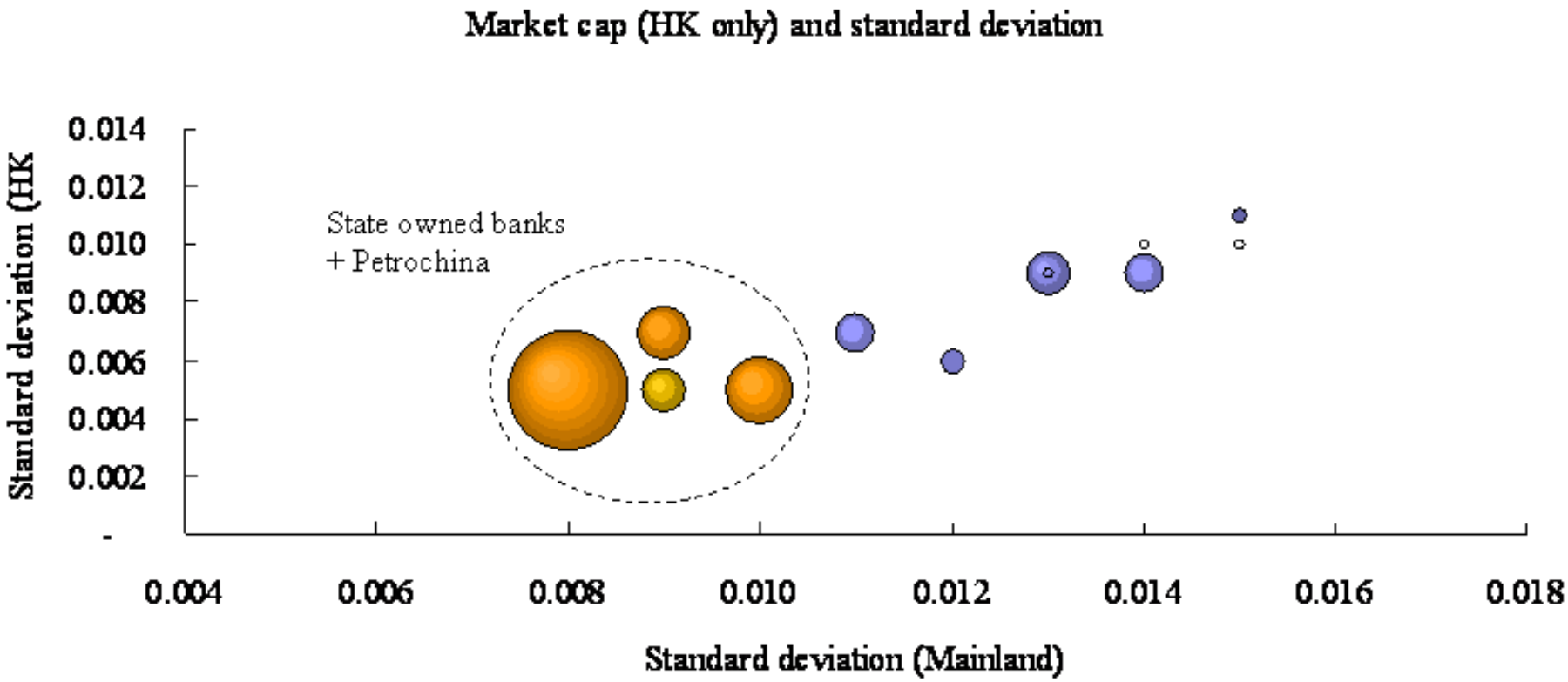
These figures seem to indicate that there is some short of relationship between being state-owned (large cap) and volatility. The large four big banks seem to be consistently in the bottom left part of the graph (lower volatilities) while the rest of the companies seem to have higher volatilities. PetroChina, which is also a state controlled company, seems to behave (volatility wise) more like a state-owned bank that as a typical corporation. For simplicity not all the companies were represented in the figures (the result is the same but the graph seem more cluttered and more difficult to interpret). Agricultural Bank of China (one of the big banks) was excluded of this graph, and many other sections in this dissertation, because the company IPO relatively recently and there is not enough data to perform a solid analysis.

Figure 10 – (Total market cap)



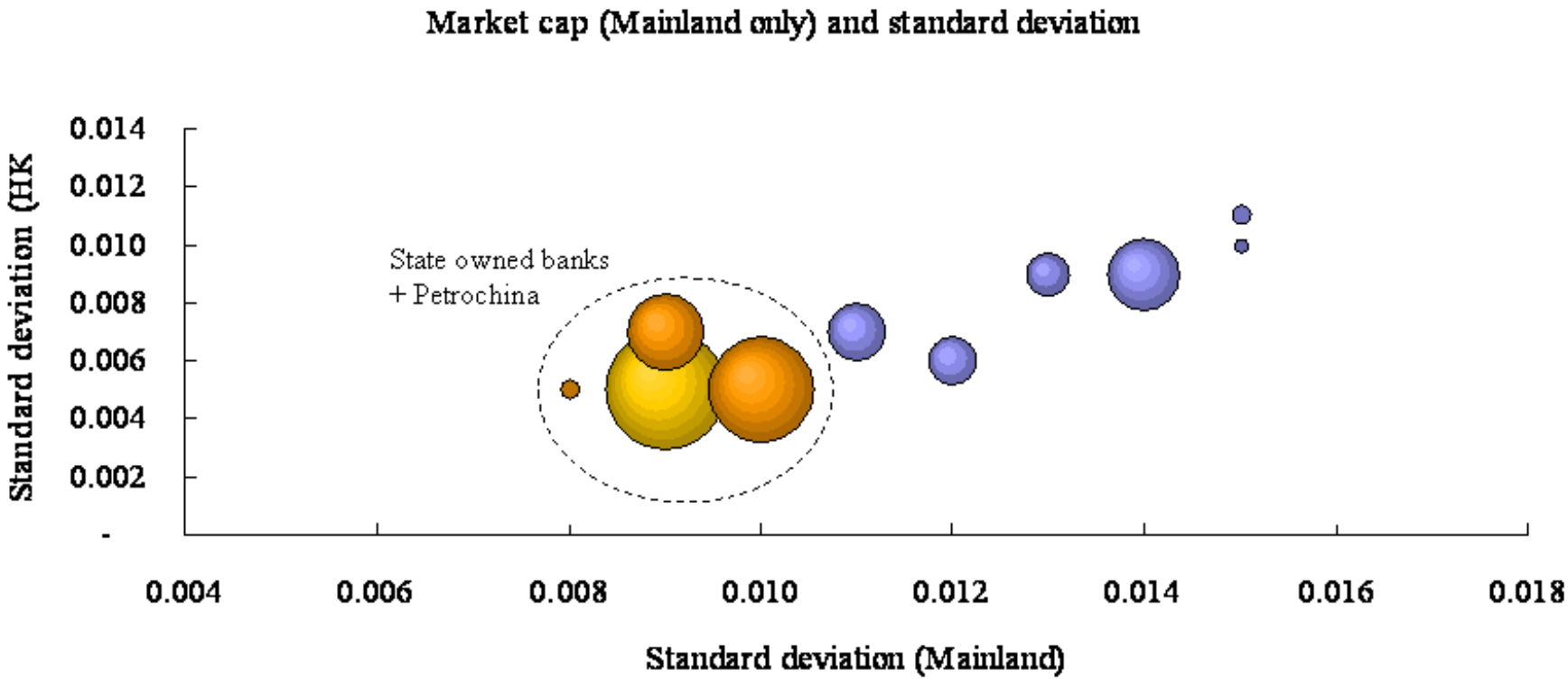
Source: Data from Bloomberg

Figure 11 – Hong Kong market cap



Source: Data from Bloomberg

Figure 12 – Mainland market cap



Source: Data from Bloomberg

4.7. Major Shareholders

The H-share market, which is dominated by institutional investors, has a big concentration among shareholders, noticeably; Blackrock, JPMorgan, Vanguard, FMR and Government of Singapore Investments (sovereign wealth fund). These companies own (according to figures from Bloomberg) a significant percentage of the total market capitalization of most dual listed companies. In the table below (Table 11) a list of the 11 top H-share (dual listed) investors is compared to the shareholder list of these companies. A "Yes" indicates that the investor analyzed is among the top 7 shareholders of the company (for A-shares). For instance, in the second line of the below table we can see that Blackrock is a major shareholder of Ping An (H-share). In fact, Blackrock owns 6.95% of Ping An's H-share. In Table 12 a list of the main shareholders of the analyzed companies is presented (data from Bloomberg). These tables include both, A-share and H-share shareholders. It can be seen that there is less investor diversification among H-share (more concentrated) than in the A-share market. In the A-share market the ownership structure tends to be dominated by one (or sometimes two) major investors that in several cases are state-owned or controlled and then several, smaller, investors. The H-share market is rather different with a hand full of institutional investors accounting for a considerable part of the equity capital.

Table 11 – H-Share Major shareholders

Companies/Investors	Ping An	China Life	China Construction Bank	ICBC	ABC	BOC	Chalco	Guangzhou Shipyard	PetroChina	SINOPEC	China Eastern Airlines	China Southern Airlines	Air China
Blackrock	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes
JP Morgan	Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Vanguard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
FMR	Yes	Yes									Yes	Yes	Yes
Citigroup					Yes					Yes			
Dimensional Fund						Yes						Yes	
Government of Singapore Inv.										Yes			
Temasek			Yes	Yes		Yes							
Capital Group				Yes	Yes	Yes							
Deustche Bank		Yes			Yes		Yes						
Invesco													Yes

Source:Bloomberg

Companies/Investors	Shandong Pharma	Shenji Group	NorthEast Electric Development	Shandong Chenming Paper	China COSCO	China Shipping Container	China Shipping Dev	Maanshan Iron & steel	Jiangxi Copper	Jingwei Textile	Zijin Mining	ZTE Corporation
Blackrock					Yes	Yes	Yes		Yes		Yes	Yes
JP Morgan					Yes		Yes		Yes		Yes	Yes
Vanguard		Yes				Yes			Yes	Yes	Yes	
FMR				Yes		Yes		Yes				Yes
Citigroup												
Dimensional Fund	Yes	Yes			Yes	Yes		Yes		Yes		
Government of Singapore Inv.							Yes					
Temasek												
Capital Group												
Deustche Bank						Yes		Yes	Yes			Yes
Invesco				Yes								

Companies/Investors	Huaneng Power	Jiangsu Expressway	China Coal Energy	China Oil Field	China Railway	China Shenhua	Anhui Conch	Beijing North Star	Beijing Printing Machinery	Angang Steel	Sinopec Chemical	Sinopec Chemical	Shenzhen Expressway
Blackrock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes			
JP Morgan		Yes	Yes	Yes	Yes	Yes	Yes			Yes			Yes
Vanguard	Yes		Yes	Yes		Yes		Yes			Yes	Yes	
FMR	Yes					Yes				Yes			Yes
Citigroup										Yes			
Dimensional Fund								Yes			Yes	Yes	
Government of Singapore Inv.			Yes	Yes						Yes			
Temasek													
Capital Group	Yes				Yes								
Deustche Bank		Yes					Yes						
Invesco											Yes	Yes	Yes

Companies/Investors	Sinopec Petrochem	Tianjin Capital	Weichai Power	Yanzhou Mining	Guangzhou Pharma	Hisense	CITIC	Datang International	China merchants	Gunzhou Shipyard
Blackrock	Yes			Yes			Yes	Yes	Yes	
JP Morgan			Yes	Yes			Yes		Yes	Yes
Vanguard	Yes	Yes						Yes	Yes	Yes
FMR					Yes					
Citigroup	Yes				Yes	Yes	Yes			
Dimensional Fund		Yes								
Government of Singapore Inv.	Yes									
Temasek							Yes			
Capital Group			Yes							
Deustche Bank				Yes	Yes			Yes	Yes	
Invesco		Yes								

Source: Bloomberg

Table 12- Major shareholders

China Construction Bank Major shareholders		**ICBC Major shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Ping An life Insurance	16.96%	China Investment Corp	47.17%
Baosteel Group	3.32%	China Ministry of Finance	46.92%
China Investment Corp	3.12%	Ping An Life Insurance	1.07%
China Life Insurance	2.13%	ICBC Credit Suisse	0.40%
CSOP Asset Management	0.75%	China Life Insurance	0.38%
Harvest Fund	0.61%	Anbang Asset insurance	0.20%
China Asset Management	0.40%	Sino Life Insurance	0.15%
H-share	**Percentage**	**H-share**	**Percentage**
China Investment Corp	59.31%	Social Security fund	11.99%
Temasek	7. 44%	Blackrock	8. 13%
Bank of America	2.47%	JP Morgan	6.85%
Vanguard	1.57%	Capital Group Company	6.39%
Baosteel Group	1.34%	Temasek	5.27%
China Investment Corp	1.15%	Vanguard group	3.99%
Blackrock	1.10%	Goldman Sachs	3.43%
ABC Major shareholders		**BOC Major shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
China Investment Corporation	44.35%	China Investment Corporation	96.58%
China Ministry of Finance	43.31%	China Life insurance	0.31%
Social Security Fund	3.78%	PICC Property & Casualty	0.10%
Ping An Life Insurance	1.36%	Sino Life Insurance	0.06%
China Life Insurance Group	0.46%	Shenhua Group	0.05%
Fortune Trust	0.38%	Aluminium Corp of China	0.05%
China Asset Management	0.11%	China Southern Power	0.05%
H-share	**Percentage**	**H-share**	**Percentage**
Capital Group	23.62%	Blackrock	10.06%
Qatar holdings	22. 18%	Social Security Fund	8. 99%
Blackrock	10.27%	Capital Group Company	7.43%
Citigroup	7.64%	JP Morgan	4.89%
JP Morgan	4.94%	Vanguard	4.62%
Deustche Bank	3.75%	Temasek	3.73%
Vanguard	3.66%	Dimensional Fund	1.27%

(Source: Bloomberg)

The rest of the companies can be found in the Appendix 15.

Blackrock ownership of some of these companies is so large that it deserves a closer look. In fact, a large portion of this ownership is through the iShares MSCI China ETF. An ETF stands for Exchange Traded Fund and in this case it tries to replicate the performance of the large and mid-cap Chinese sectors. This is a passively managed fund and it currently has (source: Blackrock) an AUM of $ 1,263,475,229.

Table 13- iShares MSCI China ETF top holdings (as of March 2013)

Name	% of fund
China Mobile	9.24%
China Construction Bank-H	8.55%
ICBC-H	6.62%
BOC	5.06%
CNOOC	4.97%
Tencent Holdings	4.70%
PetroChina	4.00%
China Petroleum & Chemical-H	3.33%
China Life Insurance-H	2.80%
Ping An Insurance-H	2.14%

Source: Directly taken from iShares performance review

Table 14-iShares MSCI China (sector Breakdown)

Sector Breakdown (%)	
Financials	40.14%
Energy	16.96%
Telecommunicaitons	11.38%
Industrials	6.24%
IT	6.22%
Consumer Services	5.41%
Consumer Discretionary	4.86%
Materials	4.21%
Utilities	3.53%
Health Care	0.94%
Other	0.12%

Directly taken from iShares performance review

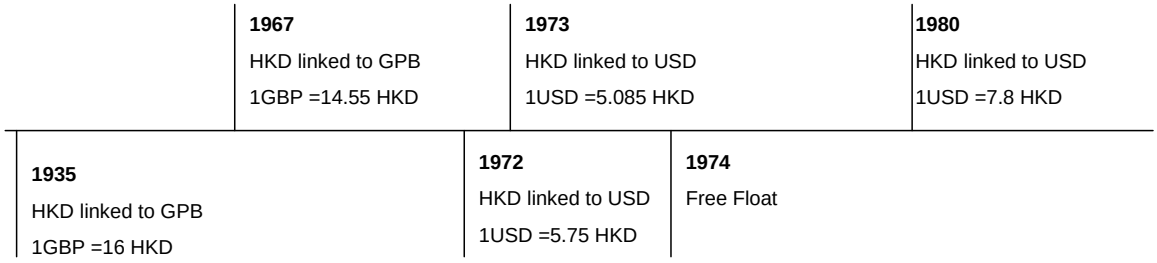
4.8. Exchange rate

An obvious issue when analyzing dual listed companies is the impact of the exchange rate. The HKD is pegged to the USD. Hong Kong has a Currency Board system in place that guarantees that this peg runs smoothly. As a result, any change in the monetary based has to be match by changes in the foreign reserves. The monetary based in Hong Kong is formed (according to the HKMA definition) by:

1) Certificates of indebtness
2) Balance of bank clearing's accounts deposited in the HKMS for clearing and settlement purposes.
3) Exchange fund bills and notes

Source: HKMA

Figure 13. HKD timeline



Source: HKMA

The RMB was pegged to the USD for a long period of time but currently it follows a more flexible approach. The authorities let the CNY trade within a band of the value of a basket of foreign currencies.

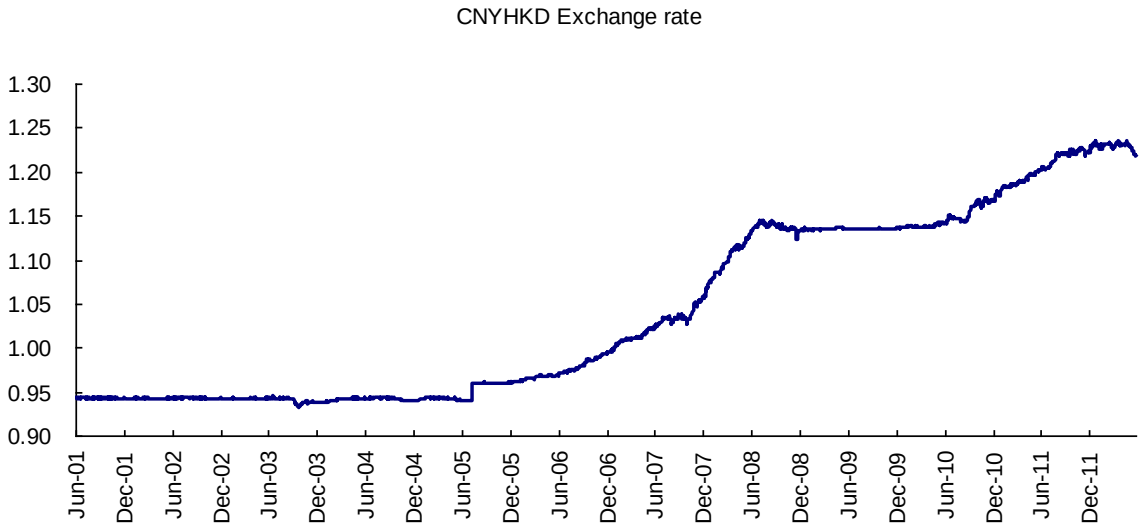
Table 15. Currency basket

Basket of currencies – CNY Exchange Rate	
US Dollar	Thailand – Baht
EURO	Russian Ruble
Japanese Yen	Australian Dollar
South Korean Won	Canadian Dollar
British Pound	Singaporean Dollar

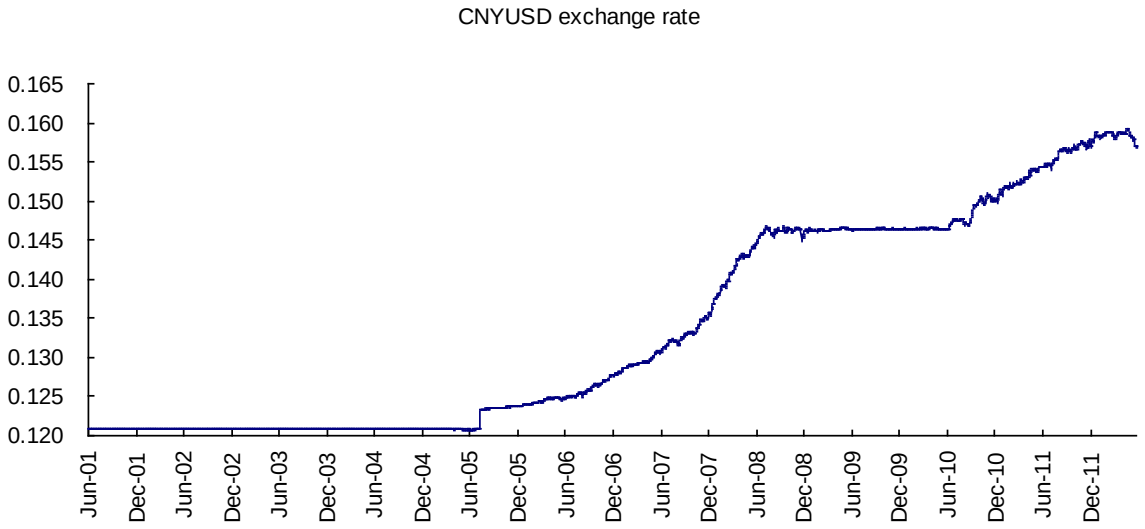
Source: PBoC

In practice, there is no excessive volatility between in the CNY/HKD exchange rate. This is partially because the weights in the components of this basket are not all equal with the USD, EUR, Japanese Yen and South Korean Won having higher representation in the basket.

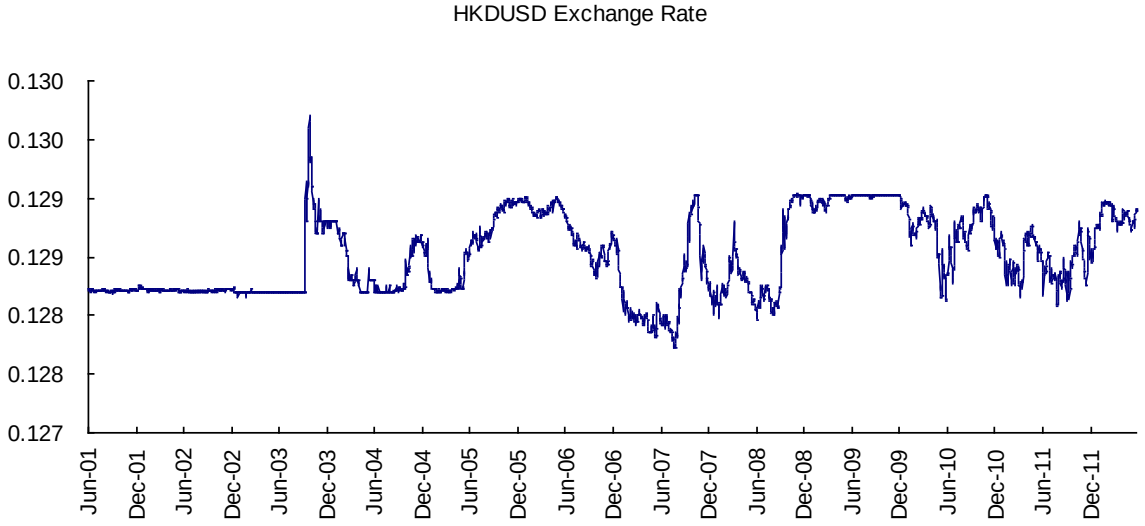
Figure 14. CNYHKD exchange rate



Source: Bloomberg



Source: Bloomberg



Source: Bloomberg

4.9. Statistical Difference

One of the first steps in the comparison of dual listed companies must be the comparison of its return from a statistical point of view. In order to do this a paired comparison was carried out. Given that the companies fundamental are the same (it is the same company traded in two different stock exchanges) it is reasonable to assume that the population is the same one, in which case the rational explained below applies [R.V. Hogg]. The daily log returns for a period of a year (from December 2010 to December 2011) for dual listed companies (A-shares and H-shares) were calculated. Log returns are used commonly instead of return given that they have some interesting mathematical properties such as additivity [Piotr,

Minkash]

$$H_0: \mu_{difference} = 0 \qquad H_a: \mu_{difference} \neq 0$$

$\mu_{difference}$ is the mean of the difference of the log returns. The test was carried out at a 5% level of confidence.

$$Test = \mu_{difference} / [\sigma/n^{½}]$$

Reject if -1.960>Test or Test>1.960

At a 5% significance level (95% confidence) we fail to reject the null hypothesis (for all the companies analyzed). At a 1% significance level (99% confidence) we also fail to reject the null hypothesis.

Table 16. Stock returns - test results

Company	Test	Fail To reject?
PetroChina	-0.414	Yes
Ping An	0.1212	Yes
North East Electric	1.0295	Yes
Anhui Conch	-0.2926	Yes
Air China	1.2663	Yes
Aluminium of China	1.0023	Yes
Angang Steel	0.7010	Yes
Anhui Highway	0.1390	Yes
Bank of China	1.3332	Yes
Bank of Communications	0.8910	Yes
Beijing North Star	0.7814	Yes
North Electric Development	1.0295	Yes
Shandong Pharmaceutical	0.9641	Yes
Shandong Chenming Paper	0.8109	Yes
Shenzhem Expressway	1.0046	Yes
Sinopec Shanghai	0.2986	Yes
Sinopec Chemical Fiber	1.1344	Yes
Tianjin Capital	0.5291	Yes
Tsingtao Brewery	0.0501	Yes
Weichai Power	-0.2527	Yes
Yanzhou Mining	0.2766	Yes
CITIC	0.3577	Yes
China Coal Energy	0.3208	Yes

Zijing Mining	0.3384	Yes
China Construction Bank	1.0458	Yes
China Cosco	0.8341	Yes
China Eastern Airlines	-0.2361	Yes
China Life	0.9583	Yes
China Merchants	0.5680	Yes
China Oilfield	-0.1222	Yes
China Petroleum	-0.5633	Yes
China Railway	1.0064	Yes
China Shenhua	-0.1610	Yes
China Shipping Container	0.8707	Yes
China Shipping Development	1.0203	Yes
China Southern Airlines	0.0416	Yes
Chongqing Iron & steel	0.0007	Yes
Datang International	-0.6602	Yes
Dongfang International	0.4765	Yes
Guashen International	0.4010	Yes
Guangzhou Pharma	0.9923	Yes
Guangzhou Shipyard	1.705	Yes
Hisense	1.0139	Yes
Hudan Power	-0.4001	Yes
Huanneng	-0.6925	Yes
ICBC	0.7592	Yes
Jiangsu Expressway	0.4104	Yes
Jiangsi Power	-0.1461	Yes
Jingwei Textile	-0.7913	Yes
Luoyang Glass	0.4611	Yes

The results are in line with expectations i.e., over a long period of time (12 months) the difference of the mean return should approach zero because we are analyzing the same company traded in two different exchanges. This seems to indicate that over a relatively long period of time (12 months) there is no difference between investing through the Hong Kong market or through the mainland markets.

4.10. Quantitative impact of the introduction of the QFII program

In order to analyze the impact of the introduction of the QFII program performance on dual listed companies the returns of those dual listed companies were analyzed for the 6 months before the introduction of the program and for a 6 month period after the introduction of the program. The mean difference in the spread was analyzed and check for statistical difference before and after the event.

The only criteria for the selected stocks were:

1) Dual listed (mainland and Hong Kong)
2) IPO date in both markets before December 31st 2001.

These conditions reduced the amount of companies analyzed to 22

Table 17. Companies analyzed

Name	H share stock Code	A Share stock Code
Angang Steel	347	898
Anhui Conch Cement	914	600585
Anhui Expressway	995	600012
Beiren Printing Machinery	187	600860
China Eastern Airlines	670	600115
China Petroleum and Chemical Corporation	386	600028
Dongfang Electric Corporation	1072	600875
Guangzhou Pharmaceutical	874	600332
Guangzhou Shipyard	317	600685
Huaneng Power International	902	600011
Jiangsu Expressway	177	600377
Jingwei Textile Machinery	350	666
Luoyang Glass	1108	600876
Maanshan Iron & Steel	323	600808
Nanjing Panda Electronic	553	600775
Northeast Electric Development	42	585
Shandong Xinhua Pharmaceutical	719	756
Shenji Group Kunming Machine	300	600806
Shenzhen Expressway	548	600548
Sinopec Yizheng Chemical Fiber	1033	600871
Tianjin Capital Environmental Protection	1065	600874
Tsingtao Brewery	168	600600

The differences of the daily lognormal returns for all the 22 companies were calculated. Share price in HKD was transformed into CNY to minimize the impact of the exchange rate. In order to perform this analysis it is necessary to establish the date in which the QFII program started to have effect in the market. To do so it is necessary to have a good understanding of the mechanics of this program. Every foreign investor that wants to access the A-share market needs to obtain its own QFII license. CSRC is in charge of approving the license. After a company receives the license it needs to receive from SAFE their quota approval i.e.,

the maximum amount of capital that they can invest in the mainland capital market through this program. After the official quota announcement the company has a period of six month to deposit the money into an special trading account (with a custodian bank) and start trading. While the quota approval announcement is public information the actual date in which the international investor started trading is not (there is a 6 months period window).

Table 18. First quota approvals

First few quota approvals		
Company	**Quota approval date**	**Quota (USD mln)**
UBS Bank	2003.06.04	300
Nomura Securities	2003.06.04	50
Citigroup	2003.06.18	350
Morgan Stanley	2003.07.01	300
Goldman Sachs	2003.07.24	50
HSBC	2003.08.26	50
Deutsche Bank	2003.08.26	50

Arguably the commencement date of the QFII program could be anywhere between June 2003 and late November early December 2003. Several dates were selected (within the previously mentioned period). At a 5% confidence level there was no indication that the introduction of the QFII and RQII market impacted the A-H spread. Given the difficulties to determine the exact date of the introduction of these pilots this result should be taken cautiously. This result is, nevertheless, consistent with the fact that the QFII pilot is minuscule in comparison with the overall market.

4.11. Normal distribution check

Normal distribution is a common assumption in finance when analyzing stock returns. Perhaps this is due to the simplicity of the model. A large amount of research articles show that this assumption is not correct. For instance [Felipe Aparicio] and [Javier Strada] show that the returns on Scandinavian markets (Denmark, Finland, Norway and Sweden) are not normally distributed. Some studies, such as [Wang Baoqian] [Wang Fengxian] have indicated that this is also the case in the Chinese market. This analysis was made at an index level rather than at a company level.

The issue of “fat tails” was identified on US stocks more than 30 years ago (1972, R.R

Officer). This article concludes that:
"… the results indicates that the returns have some but not all the properties of a stable process. The distributions have "fat tails" compared to the normal distribution".

In this article, the hypothesis that stock returns for dual listed Chinese companies (in the mainland and Hong Kong) are normally distributed was analyzed. The results of this analysis, shown in the following section, seem to indicate that the returns are not normally distributed.

A Kolmogorov-Smirnov test was performed on the log return of dual listed companies to determine if the distributions follow a standard normal distribution. The returns of the A-share, H-shares and difference were analyzed under this framework.

Null hypothesis: Ho: Normal Distribution
Alternative hypothesis: Ha: Not a Normal Distribution

The test was performed at a 5% significance level using the software package Matlab. The test statistic used by Matlab for the Kolmogorov-Smirnov test is:

$$Max\ (\ |F(x) - G(x)\ |)$$
$F(x) \equiv Empirical\ CDF$
$G(x) \equiv Standard\ Normal\ cdf$ *(source: Matlab)*

In addition a Lillie test was performed in the same set of data. The purpose of this test is also to check if the data are normally distributed or not. Similarly to the Kolmogorov-Smirnov test a 5% significance level is used. The test static used was:

$$KS = Max\ x\ (\ |SCDF(x) - CDF(x)\ |)$$
$SCDF(x) \equiv Empirical\ CDF\ estimated\ from\ the\ sample\ CDF$
$CDF(x) \equiv Standard\ Normal\ cdf$ *(source: Matlab)*

The Lillie test in Matlab uses "*a table of critical values computed using Monte Carlo simulation for sample sizes less than 1000 and significance levels between 0.001 and 0.50*". This is an issue because some of the results are outside the tabulated values.

The results for the Kolmogorov-Smirnov test are clear. H=1 for all the companies analyzed (H-share, A-share and the difference between A-share and H-shares). Therefore we reject the null hypothesis. We reject the hypothesis that the log returns of the dual listed companies follow a standard normal distribution. The Lillie test is less conclusive regarding the rejection of the null hypothesis. The limitation on the tabulated values should be considered when interpreting the results.

Overall, the analysis seems to indicate that dual listed Chinese stocks tend to not follow a normal standard distribution. This results is consistent with the academic article covering other markets such as the US or Scandinavia.

Table 19. Kolmogorov I

Company	Lillietest						Kolmogorov						Skewnes			Kurtosis			Variance		
	Hong Kong		Mainland		Difference		Hong Kong		Mainland		Difference		Hong Kong	Mainland	Difference	Hong Kong	Mainland	Difference	Hong Kong	Mainland	Difference
	H	P	H	P	H	P	H	P	H	P	H	P									
PetroChina	0	0.5000	1	0.0154	0	2.42E-05	1	2.067E-50	1	3.176E-51	1	9.188E-51	-0.3492	0.1579	0.3070	3.7821	4.7481	3.5226	7.74E-05	2.42E-05	6.25E-05
PingAn	1	0.0010	0	0.0559	1	1.00E-03	1	9.244E-49	1	1.896E-50	1	9.244E-49	0.0584	-0.4028	0.0584	6.8455	5.2509	6.8455	1.67E-04	7.56E-05	1.67E-04
NorthEast Electric	1	0.0010	1	0.0098	1	1.00E-03	1	9.495E-49	1	1.076E-49	1	9.495E-49	-0.0301	-0.2747	-0.0301	6.1085	5.7556	6.1085	1.92E-04	8.24E-05	1.92E-04
Anhui Conch	0	0.0880	0	0.5000	0	5.00E-01	1	3.876E-48	1	2.602E-49	1	1.973E-49	-0.0150	-0.0549	-0.1649	3.9705	3.6603	3.4345	2.59E-04	1.44E-04	1.54E-04
AirChina	0	0.3311	1	0.0010	0	3.27E-01	1	1.492E-49	1	2.221E-52	1	1.489E-49	-0.0571	3.0517	0.0575	3.3233	16.8572	3.3243	1.70E-04	1.58E-10	1.70E-04
Aluminium of china	1	0.0061	1	0.0265	0	1.80E-01	1	1.059E-48	1	1.045E-49	1	1.970E-49	0.1052	0.7347	-0.0065	4.7638	7.1483	4.1572	1.70E-04	8.80E-05	1.36E-04
Angang Steel	1	0.0010	1	0.0010	1	1.00E-03	1	5.786E-47	1	7.684E-51	1	7.607E-48	0.0268	-0.5266	-0.0863	7.8532	4.6541	7.0620	2.52E-04	5.08E-05	1.96E-04
Anhui Highway	1	0.0094	1	0.0036	0	1.07E-01	1	2.634E-49	1	1.673E-50	1	1.460E-49	0.0254	0.8468	-0.0574	4.5673	7.8218	3.6606	1.18E-04	5.31E-05	1.44E-04
Bank of China	1	0.0013	1	0.0013	1	1.00E-03	1	1.045E-49	1	1.741E-51	1	1.023E-49	0.3846	-0.6249	-0.0597	6.7931	7.9916	6.1994	7.82E-05	1.57E-05	5.95E-05
Bank of Comms	1	0.0010	1	0.0082	1	1.00E-03	1	1.311E-49	1	2.728E-51	1	1.690E-49	0.0126	0.1356	0.3014	5.7509	3.8423	6.1423	9.80E-05	2.48E-05	7.62E-05
Beijing North Star	1	0.0010	0	0.0635	1	1.21E-02	1	2.758E-49	1	1.424E-50	1	2.250E-49	-0.9948	-0.2957	0.8812	14.2392	4.3809	11.4872	1.06E-04	4.50E-05	1.05E-04
North Electric Dev	1	0.0010	1	0.0098	0	9.97E-02	1	9.495E-49	1	1.076E-49	1	4.799E-50	-0.0301	-0.2747	0.1163	6.1085	5.7556	3.4041	1.92E-04	8.24E-05	1.50E-04
Shandong Pharma	1	0.0010	1	0.0010	1	2.30E-03	1	3.312E-49	1	1.306E-50	1	4.001E-50	-0.0661	-0.3612	-0.2915	6.9995	4.0438	5.2156	7.85E-05	6.35E-05	7.93E-05
Shandong Chenming	1	0.0010	1	0.0333	1	5.70E-03	1	9.860E-50	1	1.584E-50	1	2.392E-49	-0.0298	-0.2460	-0.3408	4.3144	3.7107	4.7580	1.23E-04	5.94E-05	1.12E-04
Shenjing Group	1	0.1975	1	0.0483	1	1.98E-01	1	3.617E-49	1	1.643E-49	1	3.617E-49	-0.1258	-0.4640	-0.1258	3.5137	4.4868	3.5137	1.75E-04	4.49E+00	1.75E-04
Shenzhen Expressway	1	0.0021	1	0.0067	1	3.73E-02	1	1.765E-49	1	6.793E-51	1	8.590E-50	-0.1665	1.2135	0.1360	5.1571	9.3348	4.4211	1.02E-04	5.88E-05	1.08E-04
Sinopec Shanghai	0	0.0753	0	0.0906	0	5.00E-01	1	3.758E-49	1	1.281E-50	1	8.623E-50	0.0567	-0.0505	0.0113	3.6921	3.3089	2.9917	1.86E-04	7.35E-05	1.60E-04
Sinopec Chemical	1	0.1811	1	0.0246	0	7.79E-02	1	4.025E-49	1	1.275E-50	1	4.594E-49	0.1349	-0.0035	-0.3436	3.7472	2.9909	3.9032	2.26E-04	1.05E-04	1.88E-04
Tianjin Capital	1	0.0010	1	0.0010	0	1.04E-01	1	3.460E-50	1	8.789E-50	1	1.667E-50	0.6943	0.5797	0.5457	5.8413	6.0741	4.3260	7.76E-05	9.25E-05	6.81E-05
Tsingtao	0	0.5000	0	0.0566	0	5.00E-01	1	3.951E-50	1	1.076E-50	1	4.326E-50	0.1361	0.1379	-0.0796	3.0304	3.9895	3.4567	8.89E-05	4.75E-05	8.20E-05
Weichai Power	0	0.3675	0	0.2359	0	5.00E-01	1	3.872E-49	1	1.155E-49	1	1.717E-49	0.0231	0.0938	0.0983	3.9435	4.3847	3.4557	1.66E-04	9.06E-05	1.36E-04
Yanzhou mining	1	0.0153	0	0.1814	1	1.60E-02	1	4.439E-49	1	9.374E-50	1	1.638E-48	-0.3604	0.2894	0.1712	4.4047	3.9187	4.0739	1.95E-04	1.34E-04	2.06E-04
CITIC	1	0.0023	1	0.0010	1	3.50E-03	1	2.835E-49	1	1.741E-51	1	7.115E-50	0.3940	-0.6285	-0.2524	6.1069	7.9838	5.7147	9.45E-05	1.57E-05	7.24E-05
China Coal Energy	1	0.0010	1	0.0343	1	2.70E-02	1	2.069E-49	1	3.389E-50	1	5.247E-49	-0.9770	0.4440	0.2214	10.3138	5.8125	5.5143	1.58E-04	6.79E-05	1.36E-04
Zijin Capital	1	0.0010	1	0.0026	1	4.68E-02	1	2.835E-48	1	1.034E-50	1	2.116E-49	0.0946	0.8011	-0.2348	6.3594	5.5202	5.6268	1.88E-04	7.84E-05	1.38E-04
Construction Bank	0	0.1175	1	0.0010	1	4.15E-02	1	2.398E-50	1	3.171E-51	1	3.211E-50	-0.1473	-0.4495	0.3196	4.5116	4.3221	5.3751	7.17E-05	2.12E-05	6.24E-05
China Cosco	1	0.0010	1	0.0207	1	1.00E-03	1	3.236E-48	1	5.320E-50	1	2.462E-49	1.9915	0.0189	-1.0622	17.5833	4.7413	10.0272	2.27E-04	6.13E-05	1.72E-04

Table 20. Kolmogorov II

Company	Lillietest						Kolmogorov						Skewnes			Kurtosis			Variance		
	Hong Kong		Mainland		Difference		Hong Kong		Mainland		Difference		Hong Kong	Mainland	Difference	Hong Kong	Mainland	Difference	Hong Kong	Mainland	Difference
	H	P	H	P	H	P	H	P	H	P	H	P									
China Eastern Airline	0	0.1590	1	0.0010	0	1.10E-01	1	1.634E-48	1	5.578E-49	1	3.504E-49	-0.0312	0.1345	0.0893	3.9583	7.4265	3.8534	2.00E-04	9.11E-05	1.60E-04
China Life	1	0.0010	1	0.0202	1	8.60E-03	1	2.647E-49	1	1.439E-50	1	2.620E-50	-0.3892	0.3464	0.7164	6.4108	0.3464	5.8857	1.14E-04	5.45E-05	7.47E-05
China Merchants	1	0.0010	0	0.3417	1	1.00E-03	1	4.869E-49	1	5.596E-51	1	2.355E-49	0.5360	0.2586	-0.0724	6.8088	3.3162	6.2040	1.51E-04	4.22E-05	1.06E-04
China oilfield	1	0.1524	1	0.0040	0	2.36E-01	1	3.026E-49	1	5.283E-49	1	7.314E-49	0.2001	0.2971	0.0920	3.5934	4.7600	3.5514	1.70E-04	1.62E-04	2.27E-04
China Petroleum	1	0.0141	1	0.0010	1	7.60E-03	1	1.204E-49	1	2.994E-51	1	2.475E-50	-0.0342	-0.5021	0.4973	5.5306	4.9429	4.7705	7.32E-05	3.27E-05	6.15E-05
China Railway	1	0.0010	1	0.0002	1	3.10E-03	1	3.140E-48	1	2.502E-50	1	5.274E-48	0.6646	0.2706	-0.5306	6.9572	5.0858	6.3332	2.47E-04	4.98E-05	2.05E-04
China Senhua	1	0.0122	0	0.1425	0	1.44E-01	1	2.981E-50	1	2.675E-50	1	2.393E-50	-0.3808	0.3234	0.1396	3.8830	5.2675	3.4965	9.92E-05	7.33E-05	7.89E-05
China Shipping Container	0	0.1444	1	0.0010	1	7.90E-03	1	2.393E-50	1	5.778E-50	1	6.153E-49	0.1396	0.4210	-0.3218	3.4965	5.3486	4.0403	7.89E-05	6.64E-05	2.30E-04
China Shipping Development	1	0.0010	0	0.0627	0	7.20E-02	1	3.508E-48	1	6.648E-51	1	2.344E-48	0.5128	-0.5307	-0.1412	6.0492	3.8659	5.5630	2.06E-04	5.92E-05	1.78E-04
China Southern Airlines	0	0.0891	1	0.0109	1	2.76E-02	1	6.525E-49	1	1.052E-49	1	1.151E-48	-0.0239	0.2939	-0.0761	3.4854	5.1538	3.9330	2.15E-04	9.12E-05	2.21E-04
China Iron & Steel	1	0.0010	1	0.0010	1	1.00E-03	1	5.934E-49	1	2.887E-49	1	2.659E-49	0.6003	0.2782	-0.4046	9.4788	8.2885	6.6744	1.36E-04	8.45E-05	1.26E-04
Datang International	1	0.0010	1	0.0092	1	1.10E-03	1	1.666E-49	1	7.437E-50	1	3.628E-50	1.1434	0.1986	-0.9313	10.4156	6.5192	7.7716	1.15E-04	6.20E-05	1.14E-04
Dongfang International	1	0.0265	0	0.1110	0	1.01E-01	1	2.077E-49	1	1.431E-49	1	1.940E-49	-0.3128	0.0400	0.2313	3.8306	4.2501	3.6858	2.29E-04	1.02E-04	1.88E-04
Guanshen International	0	0.1645	1	0.0010	0	5.00E-01	1	1.974E-50	1	1.952E-50	1	1.558E-50	0.0192	0.5837	-0.0936	4.0557	7.0363	3.3616	5.94E-05	4.75E-05	6.43E-05
Guangzhou Pharma	0	0.3602	1	0.0491	0	4.04E-01	1	4.273E-44	1	1.041E-44	1	3.115E-45	0.0994	0.1699	-0.0126	3.8979	4.4968	3.2158	2.22E-04	2.04E-04	1.84E-04
Guangzhou Shippyard	1	0.0010	1	0.0019	0	5.00E-01	1	3.757E-49	1	5.070E-49	1	8.463E-49	0.3404	0.3081	0.1002	5.1627	4.3760	4.0747	1.41E-04	1.57E-04	1.59E-04
Hisense	0	0.0507	1	0.0010	1	1.42E-02	1	8.641E-49	1	1.203E-50	1	3.262E-48	-0.2027	-0.6520	-0.0459	4.0065	3.5201	4.9371	2.27E-04	7.48E-05	2.13E-04
Huaneng	1	0.0010	1	0.0010	1	3.50E-03	1	7.869E-50	1	3.214E-50	1	1.790E-49	0.5872	0.4301	-0.1227	7.8010	4.9901	5.0860	7.42E-05	6.73E-05	9.29E-05
ICBC	1	0.0010	1	0.0334	1	3.40E-03	1	3.710E-49	1	5.085E-51	1	1.590E-49	0.1341	-0.0619	0.0503	6.4274	4.1387	5.5667	1.05E-04	2.30E-05	8.81E-05
Jiangsu Expressway	0	0.2214	1	0.0075	0	7.57E-02	1	8.442E-50	1	1.344E-50	1	1.752E-49	0.1844	-0.9263	-0.0957	3.8651	8.2746	5.5028	1.07E-04	3.93E-05	1.03E-04
Hudan Power	1	0.0124	0	0.0737	0	5.82E-02	1	9.954E-50	1	3.467E-50	1	2.778E-50	0.0332	0.3829	-0.3428	4.3709	4.9027	3.5162	9.83E-05	7.97E-05	9.48E-05
Jiangxi Copper	1	0.0051	0	0.0506	1	4.40E-03	1	7.926E-48	1	2.085E-49	1	5.602E-49	0.3738	0.2463	-0.5557	7.2864	4.1993	6.8422	2.23E-04	1.15E-04	1.67E-04
Jingwei textile	1	0.0010	1	0.0028	0	8.74E-02	1	1.162E-47	1	5.322E-49	1	1.415E-48	-0.0941	0.0266	0.0708	8.0005	4.3729	5.6588	2.97E-04	1.71E-04	1.96E-04
Luoyang Glass	1	0.0017	1	0.0010	1	1.00E-02	1	4.829E-48	1	5.442E-49	1	1.306E-48	0.4925	-0.3222	-0.2397	4.7695	4.7051	4.6147	3.22E-04	2.06E-04	2.24E-04

4.12 Are all A-shares normally distributed?

One of the first questions to ask when analyzing A-shares is if they are normally distributed or not. In the previous section dual listed companies were analyzed. In this section this analysis was expanded to the entire A-share universe (since starting trading in the exchange). An exhaustive analysis was done in the A-share market (from 1993 to the end of 2011).

Stock prices for 965 companies were collected from the data vendor Bloomberg (the entire Shanghai universe according to this vendor) and transformed into log returns. There was no foreign exchange effect as the stocks are already denominated in RMB. The Kolmogorov test package Matlab (some examples can be found in the table below and the full list on Appendix 17).

Table 21. All A-shares – Kolmogorov

Company	Ticker	Kolmogorov Smirnov	Lilie Test		Company	Ticker	Kolmogorov Smirnov	Lilie Test	
			H	P				H	P
JINTAI FUND	500001	1	1	<0.001	ZHEJIANG WHWH INDUSTRY CO-A	600576	1	1	<0.001
TAIHE FUND	500002	1	1	<0.001	TONGLING JINGDA SPECIAL-A	600577	1	1	<0.001
HANSHENG FUND	500005	1	1	<0.001	BEIJING JINGNENG THERMAL-A	600578	1	1	<0.001
ANSHUN FUND	500009	1	1	<0.001	QINGDAO YELLOW SEA RUBBER -A	600579	1	1	<0.001
JINXIN FUND	500011	1	1	<0.001	WOLONG ELECTRIC GROUP CO L-A	600580	1	1	<0.001
XINGHE FUND	500018	1	1	<0.001	XINJIANG BA YI IRON & STEE-A	600581	1	1	<0.001
YINFENG SECURITY INVEST FUND	500058	1	1	<0.001	TIAN DI SCIENCE & TECHNOLO-A	600582	1	1	<0.001
BCOMM SCHRODER SSE180 ETF	510010	1	1	<0.001	OFFSHORE OIL ENGINEERING-A	600583	1	1	<0.001
BOSERA SSE LARGE CAP ETF	510020	1	1	<0.001	JIANGSU CHANGJIANG ELECTRO-A	600584	1	1	<0.001
SSE 180 VALUE ETF	510030	1	1	0.0064	ANHUI CONCH CEMENT CO LTD-A	600585	1	1	<0.001
CHINA 50 ETF	510050	1	1	<0.001	SHANDONG JINJING SCIENCE-A	600586	1	1	<0.001
ICBC CRED SUISSE CENT 50 ETF	510060	1	1	<0.001	SHINVA MEDICAL INSTRUMENT-A	600587	1	1	<0.001
SSE PRIVATE-OWNED ENTER ETF	510070	1	0	0.0619	YONYOU SOFTWARE CO LTD-A	600588	1	1	<0.001
CCB SOC RESPONSIBILITY ETF	510090	1	1	<0.001	GUANGDONG RONGTAI IND-A	600589	1	1	<0.001
SSE PERIODICAL INDUST 50 ETF	510110	1	1	0.0074	TELLHOW SCI-TECH CO LTD-A	600590	1	1	<0.001
SSE NON-CYCLICAL 100 ETF	510120	1	0	0.3658	FUJIAN LONGXI BEARING (GRO-A	600592	1	1	<0.001
E FUND SSE MID-CAP ETF	510130	1	0	0.2173	GUIZHOU YIBAI PHARMACEUTIC-A	600594	1	1	<0.001
CHINA MERCH SSE CONSUMER ETF	510150	1	0	0.1805	HENAN ZHONGFU INDUSTRY CO-A	600595	1	1	<0.001
CHINA SECURITY SOUTHERN ETF	510160	1	1	<0.001	ZHEJIANG XINAN CHEMICAL-A	600596	1	1	<0.001
GTJA ALLIANZ SSE CMDY EQ ETF	510170	1	0	0.0850	BRIGHT DAIRY & FOOD CO LTD-A	600597	1	1	<0.001
SHANGHAI SSE180 ETF	510180	1	1	<0.001	HEILONGJIANG AGRICULTURE-A	600598	1	1	<0.001
HUAAN SSE IND TOP INDEX ETF	510190	1	1	0.0011	PANDA FIREWORKS GROUP CO L-A	600599	1	1	<0.001

The tests performed seem to indicate that log normal returns of A-shares are not normally distributed. Once more, the Kolmogorov test returns a H=1 for all the companies, meaning

that we reject the hypothesis that the stock returns follow a normal distribution. The Lillie test was a bit more mixed but it also returned, in the overwhelmingly majority of cases, results rejecting the null hypothesis.

4.13. Direction of stock returns

One of the obvious starting points when analyzing the returns of dual listed companies is observing the direction of the changes on a daily basis i.e., do the A-share and H-share securities of the same company tend to move in the same direction on a daily basis or not. In order to do this, the period between December 2010 and 2011 was analyzed (for 51 dual listed companies). The table below shows the results:

Table 22 – Direction of stock returns

Company	Return direction		Company	Return direction		Company	Return direction	
	Opposite	Same		Opposite	Same		Opposite	Same
Petrochina	33%	67%	Weichai Power	31%	69%	Guanshen International	36%	64%
PingAn	31%	69%	Yanzhou mining	31%	69%	Guanzhou Pharma	27%	73%
NorthEast Electric Equipment	32%	68%	CITIC	21%	79%	Guanzhou Shipyard	34%	66%
Anhui conch	25%	75%	China Coal Energy	37%	63%	Hisense	35%	65%
AirChina	54%	46%	Zijin Mining	33%	67%	Hudan Power	28%	72%
Aluminium of China	35%	35%	China Construction bank	29%	71%	Huaneng	35%	65%
Angang Steel	36%	36%	China Cosco	32%	68%	ICBC	31%	69%
Anhui highway	42%	58%	China Eastern Airlines	30%	70%	Jiangsu Expressway	34%	66%
Bank Of China	22%	78%	China Life	34%	66%	Jiangxi Copper	29%	71%
Bank of Comunications	31%	69%	China Merchants	26%	74%	Jingwei Textile	33%	67%
Beijing North star	31%	69%	China oilfield	35%	65%	Luoyang Glass	31%	69%
North ElectricDEvelopment	32%	68%	China Petroleum	31%	69%			
Shandong Pharmaceutical	33%	67%	China Railway	37%	63%			
Shandong Chenming Paper	30%	70%	China Senhua	28%	72%			
Shenji Group	36%	64%	China Shipping container	33%	67%			
Shenzhen Expressway	39%	61%	China Shipping Development	37%	63%			
Sinopec Shanghai	32%	68%	China Southern airlines	35%	65%			
Sinopec Chemical Fibre	32%	68%	Chongqing Iron & Steel	30%	70%			
Tianjing Capital	28%	72%	Datang International	39%	61%			
Tisngtao Brewey	33%	67%	Dongfang International	28%	72%			

Of the 51 companies 49 had returns in the same direction i.e., A-share increase (decrease) when H-share increase (decrease), in at least 60% of the days analyzed. The only two exceptions were Air China (with 46% of daily returns in the same direction) and Anhui Highway (which falls just slightly the 60% criteria with 58% of the days registering returns in the same direction).

There seems to be an upper boundary as well with only three companies having returns in the same direction in more than 75% of the days analyzed. These companies are Bank of China (78%), Anhui Conch (75%) and CITIC (79%). There is no company above 80%. 90% of the companies analyzed follow in the 60% to 75% band.

The same analysis was repeated with a one day lag i.e., directions in the returns of the

A-share at time T and H-shares at time T-1. The results are show in the table below.

Table 23. One day lag

One day lag								
Company	Return direction		Company	Return direction		Company	Return direction	
	Opposite	Same		Opposite	Same		Opposite	Same
Petrochina	42%	58%	Weichai Power	46%	54%	Guanshen International	48%	52%
PingAn	51%	49%	Yanzhou mining	48%	52%	Guanzhou Pharma	43%	57%
NorthEast Electric Equipment	42%	58%	CITIC	44%	56%	Guanzhou Shipyard	52%	48%
Anhui conch	49%	51%	China Coal Energy	50%	50%	Hisense	44%	56%
AirChina	54%	46%	Zijin Mining	41%	59%	Hudan Power	44%	56%
Aluminium of China	49%	51%	China Construction bank	48%	52%	Huaneng	44%	56%
Angang Steel	47%	53%	China Cosco	44%	56%	ICBC	48%	52%
Anhui highway	45%	55%	China Eastern Airlines	48%	52%	Jiangsu Expressway	49%	51%
Bank Of China	43%	57%	China Life	50%	50%	Jiangxi Copper	49%	51%
Bank of Comunications	47%	53%	China Merchants	53%	47%	Jingwei Textile	53%	47%
Beijing North star	48%	52%	China oilfield	49%	51%	Luoyang Glass	44%	56%
North ElectricDEvelopment	42%	58%	China Petroleum	42%	58%			
Shandong Pharmaceutical	45%	55%	China Railway	44%	56%			
Shandong Chenming Paper	47%	53%	China Senhua	47%	53%			
Shenji Group	51%	49%	China Shipping container	42%	58%			
Shenzhen Expressway	43%	57%	China Shipping Development	48%	52%			
Sinopec Shanghai	50%	50%	China Southern airlines	47%	53%			
Sinopec Chemical Fibre	46%	54%	Chongqing Iron & Steel	47%	53%			
Tianjing Capital	42%	58%	Datang International	47%	53%			
Tisngtao Brewey	47%	53%	Dongfang International	49%	51%			

86% of the companies analyzed had A-share returns at time T in the same direction that the H-share returns at time T-1 more than 50% of the time. The range is much tighter than on the previous example (A and H share return at same time T) with no company having more than 59% of its returns (with one day lag) in the same direction and no company had less than 46% of its returns (with one day lag) in the same direction.

The analysis was repeated once again but this time changing the order of the returns (A-share at T-1 and H-share at T). In this case 70% of the companies analyzed had H-share returns at time T in the same direction that the A-share returns at time T-1 more than 50% of the time. The range is wider than before (from 62% to 46%).

Table 24. One day lag B

One day lag (A-share at T-1 and H share at T)								
Company	Return direction		Company	Return direction		Company	Return direction	
	Opposite	Same		Opposite	Same		Opposite	Same
Petrochina	46%	54%	Weichai Power	46%	54%	Guanshen International	38%	62%
PingAn	49%	51%	Yanzhou mining	53%	47%	Guanzhou Pharma	48%	52%
NorthEast Electric Equipment	53%	47%	CITIC	42%	58%	Guanzhou Shipyard	47%	53%
Anhui conch	48%	52%	China Coal Energy	44%	56%	Hisense	42%	58%
AirChina	54%	46%	Zijin Mining	42%	58%	Hudan Power	51%	49%
Aluminium of China	50%	50%	China Construction bank	44%	56%	Huaneng	45%	55%
Angang Steel	41%	59%	China Cosco	48%	52%	ICBC	42%	58%
Anhui highway	44%	56%	China Eastern Airlines	52%	48%	Jiangsu Expressway	48%	52%
Bank Of China	41%	59%	China Life	47%	53%	Jiangxi Copper	50%	50%
Bank of Comunications	45%	55%	China Merchants	46%	54%	Jingwei Textile	53%	47%
Beijing North star	40%	60%	China oilfield	51%	49%	Luoyang Glass	50%	50%
North ElectricDEvelopment	53%	47%	China Petroleum	48%	52%			
Shandong Pharmaceutical	47%	53%	China Railway	44%	56%			
Shandong Chenming Paper	46%	54%	China Senhua	53%	47%			
Shenji Group	49%	51%	China Shipping container	46%	54%			
Shenzhen Expressway	47%	53%	China Shipping Development	47%	53%			
Sinopec Shanghai	50%	50%	China Southern airlines	48%	52%			
Sinopec Chemical Fibre	51%	49%	Chongqing Iron & Steel	47%	53%			
Tianjing Capital	51%	49%	Datang International	51%	49%			
Tisngtao Brewey	45%	55%	Dongfang International	45%	55%			

4.14. Case Study - Guangzhou shipyard

Guangzhou shipyard is an interesting company for a case study. The main business line of the company is shipbuilding. There has been a global slowdown in this sector in recent years and as a consequence the company's financials were impacted. According to Hong Kong Stock Exchange rules when there is a material expected decrease in net profit (year over year) the company must issue a formal announcement (Guangzhou Shipyard followed this rules and in 2012 issue several profit warnings). Therefore it is possible to determine a specific time for an event and to analyze the volatility in both markets before and after such event.

Brief Company introduction

Guangzhou Shipyard is a traditional shipbuilder with a global clientele. Roughly a third of its revenue comes from mainland China.

Revenue breakdown	
Mainland china	44%
Denmark	31%
Holland	9%
Hong Kong	5%
Other	12%

The company describes itself as: "*Guangzhou Shipyard International (GSI), which was parented by China State Shipbuilding Corporation, is the largest modern integrated shipbuilding enterprise in South China and one of the 500 biggest enterprises in China. GSI was founded in 1954*" (source: company website).

Almost the entire revenue from the company comes from the shipbuilding business. The company also has a few other related small business line, such as the development of steel structures.

Revenue breakdown (RMB ml)	
Shipbuilding	7,200
Steel structures	428
Other	642

Analysis

The company issued in 2012 three profit warning announcements (the exact dates of the profit warning announcement are shown in the table below).

Table 25 - Profit warning announcement

Profit warning	
Date	Reason
2012-04-10	Q1 (net profit down 50%)
2012-07-24	H1 (net profit down 50%)
2012-04-10	Q1,Q2,Q3 (net profit down 50%)

Source: Hong Kong Stock Exchange and company website

The announcement, posted on the company website, followed the following format (the full announcements, of approximately 2 pages each, can be found on Appendixes 9, 10 and 11).

> *"This announcement is made pursuant to Rule 13.09(1) of the Listing Rules.*
>
> *The unaudited net profit of the Group for the first quarter as at March 31, 2012 prepared in accordance with the PRC Accounting Standards and Regulations is expected to decrease by about 50% compared with the net profit for the same period in 2011".*
>
> ***"Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company"***
>
> Source: Guangzhou Shipyard website

The volatility of the stock in the A-share market and H-share market before and after the event were calculated. A period of 15 trading days (before and after the event) was used. The day of the event itself was included in the second period i.e., the day of the announcement is accounted as one of the 15 days "after". As usual, the log returns were calculated. In this particular example exchange rate effects were not included i.e., there was no currency conversion (please note than in all other calculations in this dissertation stock prices were converted to CNY, this example is the only exemption to this rule). The idea behind excluding FX exchange is interpreting how the investor, in its own currency, sees the volatility of the market.

It is important to remark that while these announcements are clearly an "event" likely to move the stock price they are not necessarily bad. The rationale is simple, research analysts follow this type of company very closely and, most of them, have a good understanding of the sector and potential revenue/profit for the year. So it is possible that analysts were expecting an even bigger drop.

2012-4-20 announcement	A-share	H-share	F-statistics
Variance (before)	0.000116	0.000111	1.05
Variance (after)	0.000128	0.000054	2.36
F-statistics	1.10	2.05	

The results seem to indicate that at a 5% confidence level the volatility in the A-share market did not change before and after the event. The same result (at a 5% confidence level) was obtained for the H-share market (no statistically significant difference). The results also show that there is no statistically significant difference between the two markets (before or after the event).

The significance level is rather important. At a 10% significance level the null hypothesis in the F-test (equal variances) is rejected for the "after" scenario. Meaning that after the event at a 10% confidence level the volatility in the A-share market and in the H-share market are not the same. In fact, it seems that the volatility in this example after the event is bigger in the A-share market.

2012-7-24 announcement	A-share	H-share	F-statistics
Variance (before)	0.000035	0.000039	1.14
Variance (after)	0.000050	0.000043	1.17
F-statistics	1.45	1.09	

According to the results of the F-test the second announcement did not have a significant impact in the volatility in the A-share market or in the H-share market. Also, we fail to reject the Null hypothesis that the two variances (in the H-share market and A-share market) are different (both before and after the event)

2012-9-28 announcement	A-share	H-share	F-statistics
Variance (before)	0.000154	0.000151	1.02
Variance (after)	0.000025	0.000079	3.13
F-statistics	6.11	1.91	

The results from the third announcement are perhaps the most difficult to interpret. The F-test results strongly indicate that the volatility (variance) in the A-share market before and after the announcement are not equal (at a 5% or 10% significance level). According to the same

test there is no statistically significant difference before and after the event in the H-share market. These results seem to strongly indicate that there was a reduction in the volatility in the A-share market after the event (while there was not such reduction in the H-share market).

Conclusion

In this case study it is shown how market "events" seem to impact volatility in the H-share market in an unpredictable way (at least for this case). In the case of the first announcement the A-share market was more volatile than the H-share market. In the second announcement there is no statistically difference between the two markets and in the third announcement the H-share market was more volatile. This seems to contradict the assumption that the A-share market react to "events/news" in a more volatile way than the H-share one.

4.15. Predictability of returns

It is worth mentioning that several articles [Fenghua Wang] [Xuanjuan Chen] show that the Chinese market is less predictable using traditional methods such as the Fama three-factor model that other markets such as the US. [Huing-Chun Liu] mentioned the issue of fat tails in the Chinese context. It is also mentioned in these studies that while a lower level of predictability is generally associated with a more efficient market that is not the case when comparing the US and China (they believe that the Chinese market is less efficient that the US market). This represents an issue from a fundamental analysis point of view. The authors suggested that the reason behind this anomalous behavior could be a major degree of homogeneity in the Chinese market. This lower level of predictability is a factor to take into account when analyzing the spread between the H-shares and A-shares.

Table 26 - Correlations among dual listed companies (Hong Kong)

	PetroChina	PingAn	NorthEast Electric Equipment	Anhui conch	Air China	Aluminium of China	Angang Steel	Anhui highway	Bank Of China	Bank of Communications	Beijing North star	Shandong Pharmaceutical	Shandong Chenming Paper	Shenji Group	Shenzhen Expressway	Sinopec Shanghai	Sinopec Chemical Fibre	Tianjing Capital	Tsingtao Brewey	Weichai Power	Yanzhou mining	CITIC	China Coal Energy	Zijin Mining	China Construction bank	China Cosco	China Eastern Airlines	China Life	China Merchants	China oilfield	China Petroleum	China Railway	China Senhua	China Shipping container	China Shipping Development	China Southern airlines	Chongqing Iron & Steel	Datang International	Dongfang International	Guangshen International	Guangzhou Shipyard	Hisense	Hudan Power	Huanneng	ICBC	Jiangsu Expressway	Jiangxi Copper	Jingwei Textile	Luoyang Glass
PetroChina	1.000	0.027	0.095	0.085	0.075	0.018	0.036	0.139	0.017	0.064	0.071	0.091	0.093	0.135	0.240	0.146	0.194	-0.014	-0.035	0.006	0.015	-0.053	-0.065	-0.081	-0.021	-0.002	-0.095	0.045	-0.039	0.021	-0.007	0.002	0.092	0.180	-0.006	-0.070	0.105	0.039	0.009	0.041	0.174	-0.015	0.036	0.084	0.210	0.167	0.273	0.018	0.025
PingAn		1.000	0.137	0.178	0.195	0.132	0.411	0.251	0.542	0.509	0.366	0.427	0.304	0.265	0.162	0.080	0.190	0.481	0.175	0.472	0.563	0.558	0.504	0.583	0.658	0.418	0.397	0.526	0.704	0.568	0.365	0.441	0.515	0.180	0.494	0.452	0.485	0.329	0.513	0.222	0.280	0.354	0.385	0.261	0.349	0.196	0.163	0.274	0.460
NorthEast Electric Equipment			1.000	0.520	0.494	-0.125	0.446	0.307	0.449	0.458	0.432	0.232	0.384	0.217	0.260	0.471	0.464	0.234	-0.034	0.092	0.198	0.102	-0.046	0.111	0.112	0.317	0.045	0.364	0.220	0.157	0.298	0.236	0.308	0.455	0.025	0.090	0.182	0.072	0.069	0.379	0.420	0.210	0.031	0.194	0.507	0.170	0.456	0.277	0.134
Anhui conch				1.000	0.514	-0.069	0.449	0.353	0.473	0.471	0.332	0.195	0.388	0.148	0.162	0.463	0.376	0.218	-0.002	0.196	0.184	0.123	-0.031	0.095	0.116	0.318	0.138	0.423	0.314	0.269	0.283	0.344	0.375	0.492	0.051	0.118	0.252	0.061	0.112	0.372	0.450	0.310	0.008	0.174	0.575	0.109	0.533	0.221	0.164
AirChina					1.000	0.410	0.465	0.210	0.532	0.434	0.333	0.151	0.420	0.120	0.217	0.555	0.390	0.207	0.090	0.141	0.170	0.137	-0.049	0.103	0.218	0.337	0.157	0.356	0.314	0.203	0.351	0.262	0.316	0.579	0.092	0.177	0.195	0.132	0.195	0.374	0.546	0.246	0.032	0.188	0.524	0.190	0.474	0.138	0.059
Aluminium of China						1.000	0.665	0.469	0.658	0.738	0.551	0.201	0.446	0.354	0.217	0.318	0.390	0.376	0.059	0.278	0.291	0.259	0.183	0.272	0.375	0.437	0.131	0.495	0.537	0.351	0.395	0.511	0.586	0.469	0.169	0.192	0.333	0.184	0.246	0.358	0.510	0.352	0.160	0.185	0.470	0.153	0.477	0.301	0.314
Angang Steel							1.000	0.475	0.655	0.711	0.578	0.198	0.530	0.351	0.227	0.415	0.399	0.307	0.030	0.260	0.300	0.210	0.120	0.229	0.251	0.446	0.145	0.608	0.362	0.251	0.441	0.544	0.502	0.540	0.230	0.185	0.306	0.207	0.225	0.308	0.466	0.343	0.105	0.256	0.509	0.186	0.480	0.289	0.231
Anhui highway								1.000	0.219	0.260	0.165	0.152	0.200	0.154	0.303	0.141	0.280	0.079	-0.027	0.064	0.152	0.065	0.090	0.106	0.114	0.174	0.071	0.169	0.202	0.138	0.104	0.139	0.152	0.315	0.067	0.093	0.043	0.061	0.032	0.173	0.267	0.080	-0.023	0.079	0.262	0.261	0.253	0.125	0.169
Bank Of China									1.000	0.797	0.477	0.238	0.428	0.308	0.198	0.411	0.423	0.387	0.092	0.287	0.332	0.269	0.183	0.287	0.516	0.465	0.164	0.591	0.585	0.399	0.530	0.474	0.568	0.500	0.319	0.242	0.258	0.184	0.308	0.408	0.504	0.356	0.128	0.274	0.638	0.227	0.503	0.253	0.260
Bank of Communications										1.000	0.537	0.226	0.458	0.395	0.177	0.411	0.482	0.377	0.079	0.274	0.309	0.246	0.142	0.247	0.379	0.533	0.102	0.614	0.533	0.380	0.531	0.517	0.614	0.465	0.196	0.177	0.260	0.219	0.249	0.373	0.477	0.394	0.122	0.300	0.546	0.230	0.465	0.357	0.250
Beijing North star											1.000	0.141	0.424	0.417	0.220	0.291	0.455	0.266	0.096	0.203	0.206	0.190	0.197	0.182	0.157	0.313	0.045	0.376	0.278	0.165	0.351	0.393	0.373	0.418	0.125	0.090	0.333	0.078	0.156	0.374	0.421	0.273	0.101	0.248	0.416	0.190	0.459	0.305	0.259
North Electric Development												1.000	0.144	0.142	0.104	0.221	0.138	0.271	0.065	0.251	0.330	0.333	0.249	0.282	0.349	0.260	0.191	0.290	0.343	0.337	0.284	0.203	0.238	0.093	0.302	0.305	0.265	0.228	0.292	0.132	0.210	0.201	0.198	0.240	0.148	0.086	0.113	0.161	0.247
Shandong Pharmaceutical													1.000	0.161	0.191	0.341	0.314	0.298	0.047	0.226	0.234	0.174	0.091	0.183	0.297	0.400	0.105	0.461	0.320	0.307	0.410	0.422	0.418	0.398	0.172	0.111	0.185	0.144	0.231	0.272	0.325	0.278	0.053	0.199	0.338	0.193	0.378	0.280	0.121
Shandong Chenming Paper														1.000	0.151	0.194	0.352	0.193	-0.002	0.187	0.112	0.067	0.142	0.100	0.073	0.206	-0.006	0.227	0.143	0.016	0.178	0.203	0.206	0.274	0.040	-0.028	0.191	0.080	0.060	0.223	0.240	0.102	0.106	0.033	0.253	0.113	0.309	0.293	0.163
Shenji Group															1.000	0.181	0.211	0.059	-0.101	0.026	0.109	0.034	0.007	0.073	0.098	0.009	-0.030	0.110	0.061	0.019	-0.017	-0.053	0.072	0.384	0.044	-0.024	0.110	0.011	0.001	0.066	0.272	0.023	0.089	-0.026	0.340	0.330	0.315	0.159	0.170
Shenzhen Expressway																1.000	0.516	0.175	-0.004	0.104	0.017	-0.006	-0.104	0.003	0.129	0.314	0.006	0.334	0.205	0.154	0.450	0.306	0.324	0.493	0.065	0.006	0.173	0.074	0.169	0.386	0.378	0.198	0.019	0.242	0.480	0.074	0.456	0.177	0.053
Sinopec Shanghai																	1.000	0.137	-0.024	0.074	-0.003	-0.064	-0.139	0.030	0.025	0.282	-0.060	0.274	0.163	0.035	0.287	0.268	0.305	0.490	-0.017	-0.036	0.204	0.039	0.065	0.329	0.417	0.185	0.026	0.240	0.560	0.199	0.527	0.287	0.147
Sinopec Chemical Fibre																		1.000	0.207	0.432	0.473	0.487	0.421	0.305	0.546	0.378	0.324	0.361	0.594	0.401	0.371	0.460	0.395	0.138	0.416	0.313	0.498	0.347	0.366	0.132	0.224	0.361	0.414	0.264	0.212	0.082	0.074	0.183	0.356
Tianjing Capital																			1.000	0.303	0.259	0.368	0.194	0.341	0.154	0.120	0.282	0.041	0.198	0.152	0.110	0.149	0.097	-0.076	0.254	0.213	0.268	0.290	0.230	0.029	-0.018	0.153	0.232	0.119	0.013	-0.054	-0.012	0.063	0.150
Tsingtao Brewey																				1.000	0.590	0.600	0.437	0.468	0.421	0.341	0.446	0.326	0.452	0.453	0.272	0.409	0.326	0.101	0.494	0.355	0.430	0.325	0.491	0.087	0.149	0.299	0.321	0.198	0.184	0.016	0.071	0.167	0.365
Weichai Power																					1.000	0.675	0.619	0.617	0.532	0.327	0.469	0.294	0.541	0.511	0.200	0.321	0.318	0.070	0.501	0.434	0.499	0.444	0.495	0.076	0.117	0.307	0.374	0.186	0.205	0.119	0.077	0.055	0.393
Yanzhou mining																						1.000	0.681	0.661	0.572	0.316	0.543	0.279	0.622	0.520	0.225	0.338	0.282	0.013	0.588	0.490	0.531	0.425	0.520	0.033	0.089	0.326	0.409	0.207	0.123	0.039	-0.049	0.076	0.374
CITIC																							1.000	0.598	0.512	0.198	0.401	0.197	0.503	0.425	0.124	0.217	0.207	-0.037	0.543	0.415	0.424	0.301	0.453	-0.049	0.045	0.183	0.318	0.059	0.036	0.036	-0.103	0.061	0.348
China Coal Energy																								1.000	0.446	0.318	0.474	0.275	0.532	0.500	0.127	0.297	0.275	0.053	0.483	0.505	0.488	0.416	0.460	0.082	0.196	0.243	0.376	0.210	0.156	0.157	0.052	0.147	0.355
Zijin Mining																									1.000	0.352	0.409	0.401	0.741	0.592	0.399	0.381	0.433	0.101	0.457	0.388	0.346	0.300	0.381	0.193	0.175	0.377	0.317	0.219	0.259	0.072	0.098	0.135	0.374
China Construction bank																										1.000	0.221	0.516	0.563	0.491	0.466	0.592	0.556	0.317	0.408	0.202	0.470	0.227	0.327	0.255	0.398	0.472	0.180	0.328	0.289	0.099	0.194	0.368	0.259
China Cosco																											1.000	0.204	0.466	0.358	0.102	0.245	0.146	-0.014	0.448	0.596	0.406	0.343	0.457	0.021	0.039	0.186	0.354	0.121	0.144	0.011	-0.050	0.018	0.352
China Eastern Airlines																												1.000	0.520	0.463	0.543	0.476	0.563	0.315	0.270	0.179	0.292	0.120	0.360	0.292	0.400	0.384	0.175	0.218	0.440	0.204	0.323	0.322	0.245
China Life																													1.000	0.645	0.417	0.550	0.549	0.208	0.476	0.418	0.529	0.393	0.450	0.221	0.320	0.446	0.363	0.298	0.356	0.072	0.123	0.251	0.477
China Merchants																														1.000	0.464	0.414	0.506	0.062	0.425	0.337	0.360	0.229	0.422	0.197	0.263	0.385	0.197	0.244	0.200	0.139	0.090	0.229	0.365
China oilfield																															1.000	0.430	0.548	0.167	0.265	0.196	0.219	0.207	0.240	0.328	0.333	0.238	0.143	0.404	0.234	0.136	0.249	0.242	0.179
China Petroleum																																1.000	0.553	0.270	0.389	0.191	0.445	0.217	0.373	0.305	0.322	0.477	0.193	0.294	0.276	0.043	0.178	0.318	0.278
China Railway																																	1.000	0.291	0.270	0.152	0.416	0.219	0.330	0.258	0.347	0.452	0.217	0.408	0.392	0.205	0.363	0.341	0.301
China Senhua																																		1.000	0.078	0.037	0.180	-0.020	0.046	0.398	0.496	0.213	-0.023	0.166	0.558	0.250	0.602	0.253	0.094
China Shipping container																																			1.000	0.502	0.527	0.324	0.528	-0.018	0.060	0.321	0.323	0.132	0.086	0.010	-0.109	0.114	0.353
China Shipping Development																																				1.000	0.390	0.362	0.437	0.045	0.109	0.203	0.281	0.110	0.083	0.120	0.015	0.061	0.335
China Southern airlines																																					1.000	0.431	0.440	0.126	0.219	0.398	0.469	0.356	0.265	0.117	0.144	0.279	0.526
Chongqing Iron & Steel																																						1.000	0.366	0.017	0.125	0.244	0.590	0.425	0.051	0.186	0.022	0.100	0.223
Datang International																																							1.000	0.182	0.168	0.351	0.368	0.225	0.114	0.026	-0.066	0.076	0.362
Dongfang International																																								1.000	0.362	0.154	0.088	0.198	0.359	0.187	0.349	0.159	0.102
Guangshen International																																									1.000	0.285	0.086	0.173	0.447	0.194	0.548	0.219	0.166
Guangzhou Shipyard																																										1.000	0.247	0.214	0.227	0.069	0.134	0.236	0.315
Hisense																																											1.000	0.429	0.063	0.198	-0.032	0.235	0.329
Hudan Power																																												1.000	0.246	0.195	0.248	0.193	0.218
Huanneng																																													1.000	0.259	0.691	0.256	0.230
ICBC																																														1.000	0.343	0.185	0.022
Jiangsu Expressway																																															1.000	0.234	0.116
Jiangxi Copper																																																1.000	0.250
Jingwei Textile																																																	1.000

Table 27 - Correlations among dual listed companies (Mainland)

	PetroChina	Pingan	NorthEast Electric Equipment	Anhui conch	AirChina	Aluminium of China	Angang Steel	Anhui highway	Bank Of China	Bank of Communications	Beijing North star	Shandong Pharmaceutical	Shandong Chenming Paper	Shenji Group	Shenzhen Expressway	Sinopec Shanghai	Sinopec Chemical Fibre	Tianjing Capital	Tsingtao Brewey	Weichai Power	Yanzhou mining	CITIC	China Coal Energy	Zijin Mining	China Construction bank	China Cosco	China Eastern Airlines	China Life	China Merchants	China oilfield	China Petroleum	China Railway	China Seabin	China Shipping container	China Shipping Development	China Southern airlines	Chongqing Iron & Steel	Datang International	Dongfang International	Guangshen International	Guangzhou Shipyard	Hisense	Hudan Power	Huaneng	ICBC	Jiangsu Expressway	Jiangxi Copper	Jingwei Textile	Luoyang Glass
PetroChina	1.000	0.218	0.029	0.133	0.104	0.171	0.260	0.276	0.084	0.259	0.253	-0.085	0.021	0.260	0.305	0.016	0.193	0.124	-0.109	-0.054	0.026	0.014	0.014	0.046	-0.051	0.068	0.016	0.002	0.015	-0.002	0.019	0.161	0.244	0.164	0.162	0.111	0.164	-0.067	0.031	-0.025	0.044	0.149	0.092	0.142	0.258	0.169	0.229	-0.066	0.037
Pingan		1.000	0.141	0.181	0.099	0.049	0.473	0.473	0.475	0.555	0.329	0.310	0.235	0.167	0.186	0.170	0.092	0.436	0.098	0.265	0.217	0.266	0.249	0.205	0.451	0.265	0.221	0.459	0.476	0.373	0.329	0.443	0.494	0.264	0.501	0.448	0.224	0.289	0.314	0.213	0.257	0.393	0.436	0.263	0.319	0.345	0.339	0.263	0.239
Northeast Electric Equipment			1.000	0.473	-0.095	-0.088	0.402	0.402	0.279	0.311	0.327	0.497	0.445	0.495	0.247	0.494	0.246	0.421	0.088	0.168	0.094	0.087	-0.007	-0.010	0.127	0.360	0.167	0.411	0.269	0.246	0.408	0.359	0.361	0.352	0.218	0.156	0.132	0.257	0.071	0.330	0.238	0.313	0.306	0.267	0.192	0.347	0.351	0.375	0.207
Anhui conch				1.000	-0.032	-0.032	0.454	0.454	0.359	0.342	0.247	0.240	0.430	0.103	0.129	0.346	0.097	0.292	0.115	0.133	0.124	0.053	0.033	0.051	0.117	0.413	0.131	0.420	0.332	0.338	0.444	0.329	0.434	0.300	0.134	0.178	0.073	0.120	0.229	0.366	0.408	0.246	0.175	0.287	0.305	0.260	0.455	0.198	0.063
AirChina					1.000	0.004	-0.039	-0.039	-0.033	0.024	0.050	-0.045	0.033	0.038	0.005	-0.002	0.037	0.051	-0.007	-0.006	-0.143	0.097	-0.012	0.023	0.106	-0.016	0.025	-0.015	0.005	-0.012	-0.015	-0.007	-0.051	-0.039	0.079	0.086	0.010	0.013	0.039	-0.005	-0.025	0.003	0.027	-0.025	-0.048	-0.029	-0.127	0.107
Aluminium of China						1.000	0.581	0.581	0.441	0.524	0.398	0.306	0.366	0.255	0.210	0.419	0.229	0.366	-0.018	0.199	0.065	0.071	0.114	0.022	0.203	0.465	0.079	0.404	0.263	0.333	0.423	0.492	0.512	0.421	0.259	0.194	0.067	0.160	0.160	0.333	0.344	0.413	0.306	0.275	0.319	0.306	0.456	0.403	0.221
Angang Steel							1.000	1.000	0.513	0.624	0.524	0.268	0.436	0.291	0.282	0.398	0.292	0.356	0.006	0.126	0.111	0.053	0.139	0.070	0.164	0.477	0.126	0.482	0.337	0.307	0.473	0.527	0.619	0.465	0.356	0.198	0.227	0.198	0.160	0.297	0.441	0.496	0.429	0.430	0.393	0.450	0.506	0.346	0.229
Anhui highway								1.000	0.270	0.382	0.453	0.106	0.194	0.391	0.526	0.186	0.235	0.190	-0.026	0.161	0.015	-0.020	0.034	0.014	0.034	0.294	0.025	0.254	0.143	0.109	0.216	0.296	0.355	0.202	0.176	0.134	0.164	0.165	0.032	0.117	0.225	0.306	0.171	0.193	0.300	0.367	0.385	0.210	0.209
Bank Of China									1.000	0.698	0.435	0.221	0.304	0.122	0.158	0.313	0.175	0.299	0.073	0.201	0.129	0.145	0.120	0.061	0.340	0.481	0.135	0.532	0.541	0.288	0.498	0.493	0.470	0.366	0.354	0.221	0.122	0.222	0.167	0.264	0.440	0.351	0.240	0.177	0.493	0.370	0.331	0.236	0.229
Bank of Communications										1.000	0.483	0.116	0.300	0.131	0.273	0.298	0.263	0.267	0.058	0.079	0.110	0.045	0.116	0.109	0.301	0.440	0.052	0.494	0.474	0.209	0.452	0.501	0.589	0.425	0.347	0.266	0.153	0.195	0.088	0.276	0.418	0.352	0.304	0.398	0.467	0.420	0.415	0.254	0.145
Beijing North star											1.000	0.196	0.225	0.151	0.363	0.261	0.379	0.282	0.021	0.133	0.014	0.099	0.041	0.129	0.062	0.311	0.054	0.300	0.165	0.207	0.337	0.449	0.388	0.343	0.329	0.255	0.242	0.151	0.142	0.256	0.260	0.400	0.232	0.203	0.357	0.369	0.299	0.294	0.329
North ElectricDevelopment												1.000	0.553	0.122	0.001	0.298	0.019	0.511	0.276	0.397	0.315	0.394	0.270	0.134	0.292	0.327	0.457	0.295	0.394	0.414	0.243	0.180	0.267	0.149	0.500	0.471	0.309	0.459	0.336	0.392	0.116	0.313	0.332	0.255	0.065	0.388	0.139	0.229	0.327
Shandong Pharmaceutical													1.000	0.067	0.046	0.450	0.100	0.403	0.164	0.171	0.133	0.139	0.116	0.006	0.311	0.618	0.178	0.566	0.457	0.390	0.559	0.344	0.399	0.410	0.234	0.145	0.041	0.245	0.159	0.420	0.264	0.369	0.260	0.365	0.201	0.247	0.251	0.256	0.173
Shandong Chenming Paper														1.000	0.216	0.463	0.159	0.158	0.013	0.159	0.081	0.055	0.111	0.163	-0.040	0.116	0.145	0.113	-0.018	0.092	0.069	0.190	0.161	0.163	0.185	0.165	0.222	0.078	0.117	0.021	-0.042	0.265	0.096	0.137	0.154	0.141	0.180	0.163	0.195
Shenji Group															1.000	0.149	0.296	0.106	0.014	0.194	0.088	0.040	0.046	0.050	0.025	0.201	0.165	0.149	0.052	-0.009	0.073	0.203	0.214	0.229	0.214	0.100	0.352	0.145	-0.004	0.061	0.215	0.234	0.177	0.194	0.305	0.365	0.294	0.114	0.151
Shenzhen Expressway																1.000	0.369	0.273	0.023	0.114	0.078	-0.058	0.005	-0.009	0.216	0.498	-0.002	0.376	0.203	0.300	0.399	0.261	0.367	0.386	0.152	0.031	-0.024	0.102	0.184	0.340	0.378	0.432	0.247	0.226	0.196	0.357	0.380	0.328	0.119
Sinopec Shanghai																	1.000	0.000	0.005	0.041	-0.040	0.000	0.031	0.029	-0.055	0.183	-0.008	0.190	0.098	0.070	0.145	0.179	0.191	0.295	0.116	-0.054	0.169	-0.023	0.003	0.094	0.179	0.312	0.065	0.216	0.262	0.367	0.327	0.356	0.129
Sinopec Chemical Fibre																		1.000	0.163	0.277	0.264	0.249	0.260	0.148	0.322	0.377	0.340	0.383	0.347	0.474	0.408	0.321	0.335	0.210	0.410	0.412	0.208	0.360	0.360	0.316	0.125	0.388	0.413	0.260	0.164	0.172	0.295	0.254	0.222
Tianjing Capital																			1.000	0.282	0.200	0.235	0.241	0.220	0.250	0.127	0.332	0.172	0.229	0.226	0.157	0.024	0.074	-0.027	0.216	0.153	0.317	0.213	0.221	0.198	0.095	-0.035	0.113	-0.067	0.038	0.087	0.135	0.062	0.094
Tsingtao Brewey																				1.000	0.564	0.416	0.445	0.350	0.329	0.311	0.419	0.342	0.318	0.254	0.198	0.127	0.143	0.192	0.498	0.451	0.230	0.452	0.449	0.127	0.137	0.162	0.124	0.107	0.101	0.119	0.112	0.114	0.131
Weichai Power																					1.000	0.364	0.698	0.349	0.255	0.253	0.424	0.205	0.204	0.259	0.176	0.079	0.117	0.100	0.361	0.416	0.257	0.388	0.419	0.099	0.106	0.120	0.106	0.135	0.170	0.082	0.022	0.027	0.049
Yanzhou mining																						1.000	0.425	0.298	0.395	0.141	0.428	0.211	0.241	0.206	0.144	0.017	0.068	0.030	0.260	0.411	0.253	0.244	0.220	0.193	0.031	0.017	0.172	0.095	-0.028	0.145	-0.002	-0.049	0.173
CITIC																							1.000	0.492	0.206	0.173	0.374	0.198	0.226	0.187	0.114	0.103	0.073	0.050	0.472	0.266	0.235	0.445	0.323	0.005	0.089	0.129	0.124	0.088	0.060	0.127	-0.048	0.053	0.070
China Coal Energy																								1.000	0.075	-0.000	0.177	0.150	0.115	0.115	-0.016	-0.005	-0.009	0.029	0.209	0.100	0.171	0.174	0.209	-0.057	0.049	0.030	0.072	0.076	0.127	0.221	0.037	0.123	0.086
Zijin Mining																									1.000	0.481	0.202	0.436	0.595	0.292	0.433	0.195	0.225	0.122	0.250	0.276	0.044	0.349	0.229	0.295	0.214	0.166	0.291	0.073	0.099	0.044	0.103	0.148	0.077
China Construction bank																										1.000	0.277	0.694	0.514	0.447	0.650	0.325	0.467	0.477	0.365	0.213	0.087	0.340	0.312	0.414	0.370	0.490	0.245	0.269	0.265	0.240	0.346	0.267	0.044
China Cosco																											1.000	0.228	0.299	0.264	0.201	0.076	0.106	0.059	0.397	0.333	0.230	0.472	0.347	0.093	0.066	0.230	0.176	0.141	0.070	0.073	0.033	0.098	0.209
China Eastern Airlines																												1.000	0.640	0.573	0.617	0.445	0.470	0.351	0.204	0.258	0.040	0.314	0.235	0.425	0.367	0.408	0.264	0.328	0.295	0.309	0.295	0.295	0.095
China Life																													1.000	0.372	0.490	0.295	0.340	0.177	0.340	0.366	0.144	0.367	0.275	0.271	0.301	0.230	0.265	0.189	0.233	0.199	0.170	0.163	0.057
China Merchants																														1.000	0.476	0.339	0.310	0.254	0.321	0.359	0.072	0.344	0.426	0.252	0.210	0.316	0.373	0.255	0.111	0.088	0.296	0.307	0.191
China oilfield																															1.000	0.452	0.474	0.266	0.279	0.277	0.025	0.223	0.200	0.419	0.368	0.334	0.224	0.373	0.291	0.299	0.295	0.217	0.096
China Petroleum																																1.000	0.458	0.473	0.389	0.291	0.142	0.195	0.138	0.410	0.260	0.399	0.321	0.309	0.301	0.386	0.333	0.366	0.301
China Railway																																	1.000	0.342	0.301	0.234	0.067	0.206	0.089	0.181	0.321	0.302	0.338	0.369	0.279	0.367	0.325	0.261	0.129
China Seabin																																		1.000	0.236	0.083	0.069	0.057	0.187	0.277	0.349	0.317	0.220	0.277	0.244	0.199	0.377	0.351	0.164
China Shipping container																																			1.000	0.661	0.407	0.232	0.433	0.113	0.146	0.397	0.302	0.211	0.215	0.232	0.126	0.079	0.245
China Shipping Development																																				1.000	0.323	0.414	0.382	0.126	0.016	0.261	0.259	0.128	0.195	0.153	0.071	0.025	0.229
China Southern airlines																																					1.000	0.330	0.199	0.151	0.043	0.078	0.243	0.196	0.316	0.285	0.120	0.086	0.290
Chongqing Iron & Steel																																						1.000	0.429	0.195	0.130	0.209	0.264	0.261	0.112	0.122	0.097	0.226	0.201
Datang International																																							1.000	0.222	0.139	0.219	0.191	0.150	0.149	0.060	0.110	0.131	0.089
Dongfang International																																								1.000	0.274	0.173	0.272	0.203	0.207	0.168	0.206	0.210	0.229
Guangshen International																																									1.000	0.195	0.113	0.209	0.330	0.210	0.414	0.195	0.095
Guangzhou Shipyard																																										1.000	0.316	0.253	0.224	0.194	0.276	0.315	0.226
Hisense																																											1.000	0.807	0.187	0.368	0.242	0.368	0.354
Hudan Power																																												1.000	0.227	0.374	0.272	0.143	0.228
Huaneng																																													1.000	0.314	0.349	0.161	0.236
ICBC																																														1.000	0.340	0.125	0.134
Jiangsu Expressway																																															1.000	0.261	0.105
Jiangxi Copper																																																1.000	0.225
Jingwei Textile																																																	1.000

4.16. Correlations

One issue that it is important to understand is if the linear correlations in both markets hold i.e., if the returns of the stocks are correlated in Hong Kong it would make intuitive sense that it should be correlated also in the mainland and vice versa. These linear correlations should also be understandable from a fundamental analysis point of view. Let's pick Bank of China as an example. Bank of China is one of the four big state-owned banks.

Table 28. Banks

"Big four" State owned banks
Bank of China
Agricultural Bank of China
Industrial and Commercial Bank of China
China Construction Bank

Tier 2 – Commercial Banks
Bank of Communications
Guangdong Development Bank
CITIC Bank
China Everbright Bank
Shenzhen Development Bank
Chiha Merchants Bank
Huaxia Bank
Minsheng Bank
China Merchants Bank
Shanghai Pudong Development Bank
Industrial Bank

The scope of these banks is not purely maximize stock holders returns but to enable the execution of the economic policies of the government. It is reasonable to assume that the stock returns of this type of institution should be very highly correlated. It is also reasonable to expect that these big-four state-owned banks have large correlations to other type of banks such as Tier 2 commercial Banks (please note that not all of these banks are dual listed and that while Agricultural Bank of China is dual listed it was not included in this analysis as its H-share IPO happened too recently).

The data support the view that the correlations should be high among these institutions, Bank of China largest linear correlations are:

Table 29. Banks correlation

Company	Hong Kong	Mainland
China Construction Bank	0.797	0.648
China Construction Bank	0.516	0.034
China Merchants	0.568	0.541
ICBC	0.638	0.463

Literature review

[Spitzer] wrote an interesting article about the persistence of price differential in Chinese stocks (A-share and H-share). Spitzer's article analyses seven dual listed companies.

Companies covered in Spitzers's article		
Company	**Ticker (HK)**	**Ticker (Mainland)**
Anhui Conch	600585	914
Bank of China	601988	3988
China Life	601628	2628
China Shipping development	600026	1138
China Merchants Bank	600036	3968
Jiangxi Copper	600362	0358
Sinopec Copper	600028	0386

Source: Taken from [Spitzer]

Spitzers' follows a slightly different convention than this thesis as share prices are translated into HKD rather than into RMB. This convention is followed by some analysts. In the work presented in this thesis the opposite convention was chosen i.e. share prices were expressed in RMB. The rationale behind this is that in seems logical to use the currency in which most of

the revenue of the analyzed companies is received. For instance the bulk of the operations of Bank of China are in mainland China (RMB denominated) and that's the case for the rest of the companies analyzed. One of the main conclusion of Spitzers' work is that the price differential seems not to be decreasing (as expected giving the increasingly interactions between the Hong Kong and mainland economies). This result is consistent with this thesis.

Another very interesting article is the one written by Mau-Hung. Mau-Hung concludes that "*that there is a causal relationship run from China A-shares to China H-shares. Furthermore, the causal relationship runs from A-shares to H-shares but not from China H-shares to China A-shares*". This is institutively appealing result. It could be argued that the news affecting those companies are "originated" in mainland China (where those companies have the bulk of their operations) and there might be a time delay between mainland China investors assimilating and reacting to the news and the time in which Hong Kong based investors do the same (the fact that news are likely generated in mandarin and not Cantonese can be another factor causing a time lag).

Another frequently cited report is the one written by the Hong Kong Monetary Authority in 2007 (Fong, Wong). This article analyzes the persistence of a price differential between A-share and H-share dual listed stocks an concludes that four factor are the most relevant impacting this spread "*Consistent with most previous studies on the overseas emerging markets and the Chinese markets, our findings suggest that four of the five micro factors – namely, market liquidity, shares supply, risk level and market conditions – are important determinants of the premium*" [Fong, Wong]

Main factors impacting price differentials **(Fong, Wong)**
Market liquidity
Shares supply
Risk level
Market conditions

Source: taken from [Fong, Wong]

Fong and Wong also conclude that the "macro-economic imbalances on the mainland" have no significant impact on the price differential. They were referring to issues such as monetary expansion or RMB appreciation expectations.

Most of the articles in this topic focus on daily, rather than intraday data. One exception is the article written by Xia Pan, Kabing Li and Jeffrey E. Jarret. In this article the authors chose to analyze stock prices at a 5 minutes interval (relatively high frequency). They conclude that there is no material integration between the markets "the arbitrage simulation did not result in a short term co integration of the two equity markets. In a sense, the influence of one market did not seem to affect transaction in the second equity market. These results are probably not surprising since the high frequency data appears to have long run relationships. The VECM also, indicated that the two markets do need a period to adjust to each other." [Pan, Li, Jarret]. This result is fully consistent with the suggested idea that information needs some time to be transferred from the mainland to Hong Kong (but it is also clearly not a proof of this statement).

4.16.1 Correlation – Multidimensional Scaling

Clearly, the correlation tables shown in previous sections are a bit hard to interpret. In an attempt to present these data in a more visually friendly way a MDS analysis was performed. The additive constant method was used.

4.16.1.1 Introduction to Multidimensional Scaling MDS

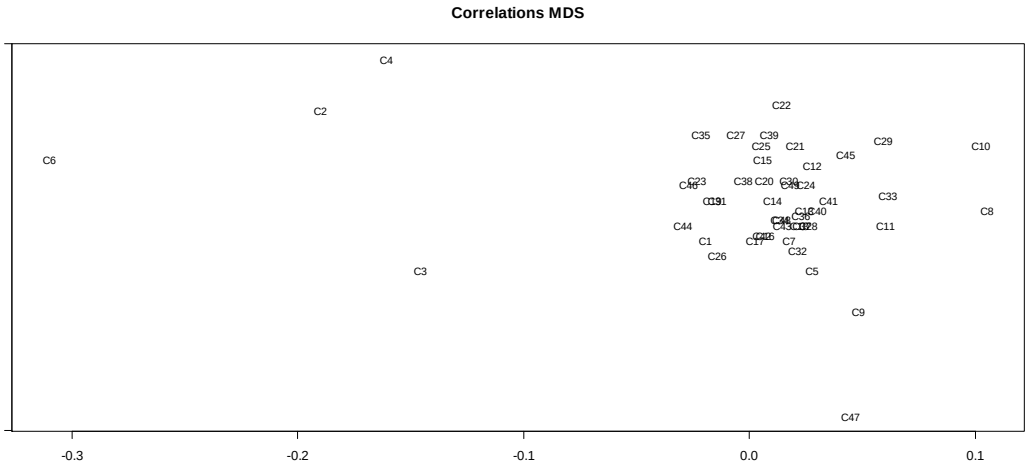
Multidimensional Scaling is a technique commonly used in finance and other fields. For Instance, [Tenreiro] used this technique to analyze the global stock markets concluding that it is possible to do some grouping (of markets) according to behaviors. The starting point for this analysis is a matrix with a measure of similarities (or dissimilarities). The typical example of this type of analysis is the distance between cities (NDS trends to do a good job a recreating a map when the only information known is the Euclidean distance between a group of cities). A good introduction to this topic can be found in [Florian] or [Groenen]. The procedure to do this analysis is relatively simple [2]. The analysis performed in this section follows the procedure as described by [Florian]:

Taken from [Florian]

1) *" Set up the matrix of squared proximities* $\boldsymbol{P}^{(2)}$*"*
2) *"Apply de double centering:* $\boldsymbol{B} = -0.5\boldsymbol{J}\boldsymbol{P}^{(2)}\boldsymbol{J}$ *using the matrix* $\boldsymbol{J}=\boldsymbol{I}-n^{-1}\boldsymbol{1}\boldsymbol{1}'$ **"**
3) *"Extract the m largest positive eigenvalues* $\lambda_1 \ldots \lambda_m$ *of* $\boldsymbol{B}$ *and the corresponding m eigenvectors* $e_1 \ldots e_m$*"*
4) *"A m-dimensional spatial configuration of the n objects is derived from the coordinate matrix* $X = E_m \Lambda_m^{1/2}$*, where* E_m *is the matrix of m eigenvectors and* Λ_m *is the diagonal matrix of m eigenvalues of B"*

4.16.1.2 Analysis

The analysis was performed using the software package R (R is an open source package) and following the previously illustrated procedure.



The data seems to have a considerable amount of clustering but there are also some outliers. For convenience (in order to have a less cluttered graph) the names of the companies were replaced by the index C_j. The complete list of names and C_j is shown in Appendix 14.

There seems to be four relatively clear outliers:

Cj	Company name
C_1	Ping An
C_2	North East Electric
C_3	Anhui Conch
C_4	Aluminum of China

4.17. Volatility

4.17.1. Introduction

Another related issue that has attracted a lot of attention is volatility. The A-share market is notorious for its high volatility. [Hui Miao and Wensheng Peng] consider that one of the factor that might cause such volatility is the investor base (with a large percentage of retail investors)

Hui Miao and Wensheng Peng (HKMA) estimates on investor base			
	Mainland China (%)	US (%)	HK (%)
Individual Investors	69	37	30
Institutional Investors	31	63	70
Mutual Funds	27	25	-
Contracted Savings	4	38	-

Source: taken from [Miao, Peng]

Miao and Peng mentioned that the main factors affecting these differences in volatility are: 1) investor base, 2) market concentration and 3) trading mechanism.

A related and very interesting article, is the one written by Lilian Ng and Fei Wu. The authors analyzed the behavior of retail investors in mainland China. According to their classification roughly 93.3% of the investors participating in the market are considered to be not sophisticated and accounting (according to the authors data) for roughly 50.7% of the volume. This article concludes that this type of investors hold for too long to loosing investments. Perhaps one of the most interesting conclusions (consistent with other articles) is that "*Increasing stock volatility of large stocks is mainly attributable to excess selling by individual investors with lower trade value and hence less sophistication*" [Ng,Wu]. This article is rather robust as it has access to the data of more than 4.7 million active retail investors.

4.17.2 Analysis

The standard deviation (and variance) of dual listed companies were calculated for a 12 months period. Stock prices were transformed into log returns (in a previous step H-shares HKD prices were transformed into CNY prices). The F-test was performed to compare the variances. Standard deviations for each company are shown in the table below.

Table 30. Volatility

Company	Standard deviation (HK) - in RMB	Standard deviation (Mainland) - in RMB	F-test (1=not equal)
Luoyang Glass	0.013	0.009	1
Jinwei Glass	0.018	0.013	1
Jiangxi Copper	0.015	0.011	1
Jiangsu Expressway	0.010	0.006	1
ICBC	0.010	0.005	1
Huanneng	0.009	0.008	0
Hudian Power	0.010	0.009	1
Hisense	0.015	0.009	1
Guangzhou Shipyard	0.012	0.012	0
Guangzhou Pharma	0.015	0.014	0
Guansheng International	0.008	0.007	1
Dongfang international	0.015	0.010	1
Datang International	0.011	0.008	1
Chonqing International	0.012	0.009	1
China Southern Airlines	0.015	0.010	1
China Shipping Development	0.014	0.008	1
China Shipping Container	0.016	0.008	1
China Shenhua	0.010	0.009	1
China Railway	0.016	0.007	1
China Petroleum	0.009	0.006	1
China Oilfield	0.013	0.013	0
China Merchants	0.012	0.006	1
China Life	0.011	0.007	1
China Eastern Airlines	0.014	0.010	1
China Cosco	0.015	0.008	1
China Construction Bank	0.008	0.005	1
Zijin Mining	0.014	0.009	1
China coal energy	0.013	0.008	1
CITIC	0.010	0.004	1
Yanzhou Mining	0.014	0.012	1
Weichai Power	0.013	0.010	1
Tsingtao Brewery	0.009	0.007	1
Tianjin Capital	0.009	0.010	1
Sinopec Yizheng Chemical Fiber	0.015	0.010	1
Sinopec Shanghai	0.014	0.009	1
Shenzhen Expressway	0.010	0.008	1
Shenjin Group	0.013	0.012	1
Shandong Chenming	0.011	0.008	1

Shandong Pharmaceutical	0.009	0.008	1
Northeast Eletrci Development	0.014	0.009	1
Beijing North Star	0.010	0.007	1
Bank of Communications	0.010	0.005	1
Bank of China	0.009	0.004	1
Anhui highway	0.011	0.007	1
Angang Seel	0.016	0.007	1
Aluminium of China	0.013	0.009	1
Anhui Conch	0.016	0.012	1
Northeast Electric	0.014	0.009	1
PetroChina	0.009	0.005	1
Ping An	0.013	0.009	1

In table 30 it is shown how the standard deviation for most H-share stocks (log return adjusted for currency) is larger than for their A-shares counterparties. At a 5% confidence level the F-test rejects the null hypothesis. The null hypothesis is that both variances (for the A-share market and H-share market) are equal. There are several academic and professional reports mentioning that the A-share market is more volatile than the H-share market [Miao], [Chan]. An F-statistic test was performed to compare the variances of each company (in the H-share market and in the A-share market). The results seem to indicate that the volatility of the H-share stocks is larger than the volatility of the A-share stocks (for the analyzed period). This seems to indicate that while, as shown by Miao, the A-share market, for some period of times, is more volatile than the H-share market this relationship does not holds for all reasonably long (12 months) periods at a company level (dual listed).

4.17.3 Conclusion

From the previous analysis it seems reasonable to conclude that for dual listed companies A-share volatility is not necessarily higher than H-share volatility (log return and currency adjusted) for any period of time.

It was shown that over a one year period of time the volatility of the A-share market was , for most of the companies analyzed, smaller than the volatility for the their H-share counterparties.

It is perhaps reasonable to assume that the while there are factors, such as a proportionally larger amount of retail investors or an arguably more “reliable” legal system (that’s a difficult

point to quantify but it has been defended by some scholars), driving up volatility in the A-share market this is not always the case.

4.18. Efficient Frontier

To further enhance our understanding of Chinese dual listed companies two efficient frontier portfolios were built. One with the dual listed A-shares and the other with the dual listed H-shares. The efficient frontiers were built in Matlab following standard procedures [Ringgenberg] and using historical values (daily log returns for 12 months). The concept of efficient frontier was introduced by Markowitz and basically tries to represent the best possible return for a certain amount of risk. It was assumed that investors hold no cash (100% securities). No short-selling was allowed when building the efficient frontiers. Perhaps the main conclusion is how different these efficient frontiers are. Comparisons between the two markets are not straight forward but for a pure risk/reward angle the differences are considerable.

Figure 15. Efficient Frontier (Hong Kong)

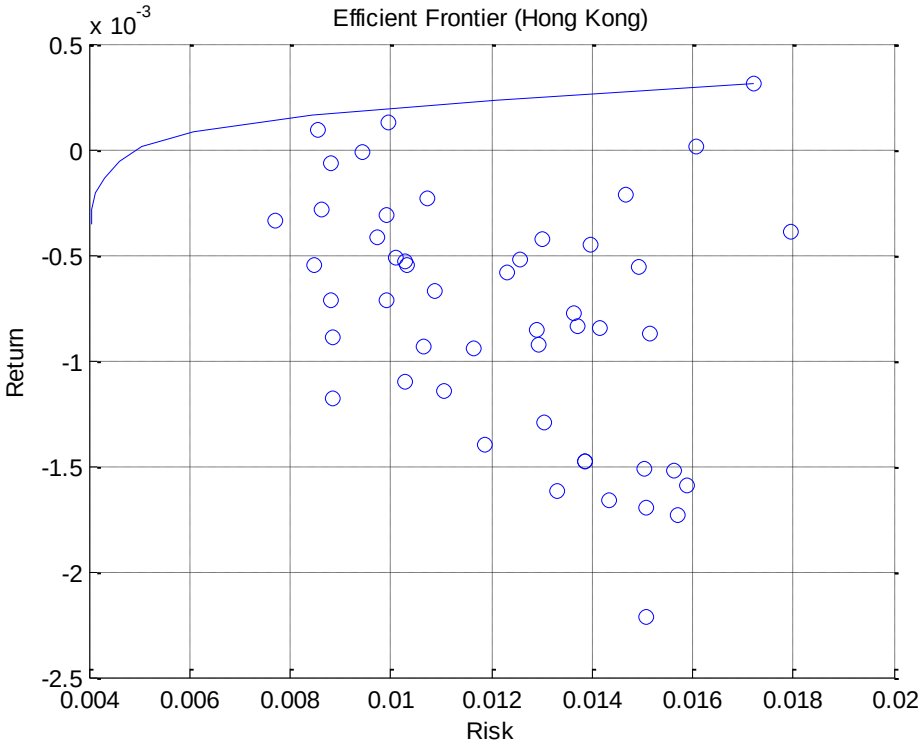
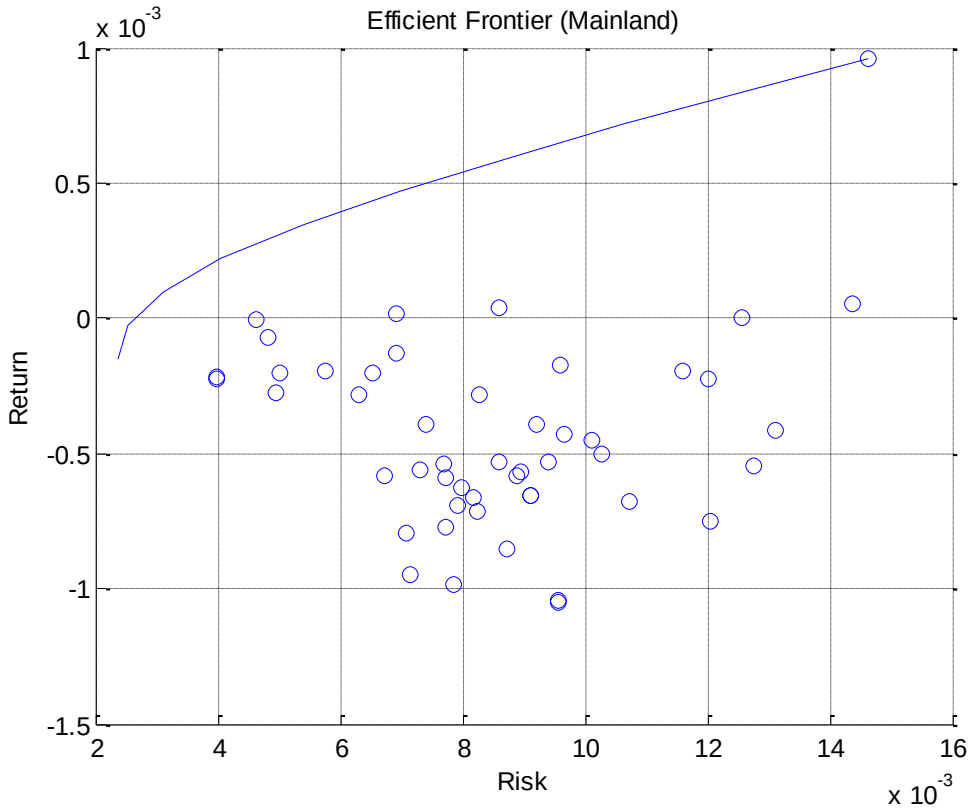


Table 31. Efficient Frontier (Hong Kong)

Hong Kong Shares									
Risk	Return (1.0e-003 *)	Aluminium of China	Angang Steel	Anhui Conch	Anhui Highway	Bank of China	BCom	Beijing North Star	CCB
0.0041	-0.3563	-	-	-	0.0360	-	-	-	0.0260
0.0041	-0.2824	-	-	-	0.0334	-	-	-	0.0217
0.0041	-0.2085	-	-	-	0.0271	-	-	-	0.0128
0.0043	-0.1346	-	-	-	0.0019	-	-	-	-
0.0046	-0.0607	-	-	-	-	-	-	-	-
0.0051	0.0132	-	-	0.0027	-	-	-	-	-
0.0061	0.0871	-	-	-	-	-	-	-	-
0.0084	0.1610	-	-	-	-	-	-	-	-
0.0121	0.2349	-	-	-	-	-	-	-	-
0.0172	0.3088	-	-	-	0.0000	-	0.0000	0.0000	-
China Eastern Air.	Merchants Bank	China Oilfield	China Petroleum	China Shipping	China Coal Energy	China Cosco	China Iron & Steel	China Life	China Railway
0.0137	-	-	0.0555	-	0.0417	-	-	-	-
0.0069	-	-	0.0896	-	0.0492	-	-	-	-
-	-	-	0.1253	-	0.0521	-	-	-	-
-	-	-	0.1689	-	0.0333	-	-	-	-
-	-	-	0.2148	-	0.0013	-	-	-	-
-	-	-	0.2621	-	-	-	-	-	-
-	-	-	0.3194	-	-	-	-	-	-
-	-	-	0.3588	-	-	-	-	-	-
-	-	-	0.1007	-	-	-	-	-	-
0.0000	0.0000	-	-	0.0000	0.0000	-	0.0000	-	0.0000
China Shenhua	China Shipping Dev	China Southern Air.	CITIC	Datang Int.	Dongfang Int.	Guanzhou Shipyard	Guashen Int.	Hisense	Huanneng
-	-	-	-	-	-	-	0.1756	-	0.0841
-	-	0.0015	-	-	-	-	0.1775	-	0.0807
-	-	0.0129	-	0.0010	-	-	0.1746	-	0.0779
0.0223	-	0.0191	-	0.0067	-	-	0.1526	-	0.0491
0.0567	-	0.0228	-	0.0086	-	-	0.1099	-	0.0043
0.0836	-	0.0164	-	-	-	-	0.0432	-	-
0.1666	-	-	-	-	-	-	-	-	-
0.2693	-	-	-	-	-	-	-	-	-
0.2942	-	-	-	-	-	-	-	-	-
-	0.0000	0.0000	0.0000	0.0000	0.0000	-	0.0000	0.0000	-
Hudan	ICBC	Jiangsu Exp.	Jiangxi Copper	Jingwei Textile	Luoyang Glass	NorthEast Electric	North Electric Dev	PetroChina	Ping An
0.0058	-	0.0359	-	-	-	-	-	0.1632	-
0.0166	-	0.0286	-	-	-	-	-	0.1783	-
0.0233	-	0.0176	-	0.0045	-	-	-	0.1960	-
0.0190	-	-	-	0.0198	-	-	-	0.2267	-
0.0182	-	-	-	0.0363	-	-	-	0.2579	-
-	-	-	-	0.0599	-	-	-	0.2937	-
-	-	-	-	0.1587	-	-	-	0.1715	-
-	-	-	-	0.3006	-	-	-	-	-
-	-	-	-	0.6050	-	-	-	-	-
0.0000	0.0000	-	-	1.0000	0.0000	-	-	-	0.0000
Shangdong Cheming	Shangdong Pharma	Shenji Group	Shenzhen Expressway	Sinopec Shanghai	Sinopec Chemical	Tianjin Capital	Tsingtao	Weichai Power	Yanzhou Mining
-	0.0666	0.0106	0.0986	-	-	0.0348	0.1520	-	-
-	0.0354	-	0.1010	-	-	0.0175	0.1621	-	-
-	-	-	0.1019	-	-	-	0.1730	-	-
-	-	-	0.0891	-	-	-	0.1914	-	-
-	-	-	0.0540	-	-	-	0.2152	-	-
-	-	-	0.0004	-	-	-	0.2381	-	-
-	-	-	-	-	-	-	0.1837	-	-
-	-	-	-	-	-	-	0.0713	-	-
-	-	-	-	-	-	-	-	-	-
0.0000	0.0000	0.0000	0.0000	-	-	-	-	0.0000	0.0000
Zijin Mining									
-									
-									
-									
-									
-									
-									
-									
-									
-									

Figure 16. Efficient Frontier (Mainland)



The efficient frontier is clearly an important tool for any investor who cares about risk adjusted returns. The decision of not allowing short selling in the efficient frontier is consistent with the strict limitations of short selling in the mainland (particularly for foreign investors). As previously mentioned short selling is allowed for most stocks in the Hong Kong market but in an attempt to make the two analyses more comparable short selling was not allowed in the calculation of the efficient frontier. The analysis also assumes that the investor is fully invested (holding no cash).

Table 32. Efficient Frontier (Mainland China)

Mainland Shares									
Risk	Return (1.0e-003 *)	Aluminium of China	Angang Steel	Anhui Conch	Anhui Highway	Bank of China	BCom	Beijing North Star	CCB
0.0023	-0.1511	-	-	-	0.0181	0.1717	-	-	0.0989
0.0025	-0.0273	-	-	-	-	0.0851	-	-	0.2082
0.0031	0.0965	-	-	-	-	-	-	-	0.3033
0.0040	0.2202	-	-	-	-	-	-	-	0.3473
0.0054	0.3440	-	-	-	-	-	-	-	0.3208
0.0070	0.4678	-	-	-	-	-	-	-	0.2218
0.0087	0.5916	-	-	-	-	-	-	-	0.1074
0.0106	0.7153	-	-	-	-	-	-	-	-
0.0125	0.8391	-	-	-	-	-	-	-	-
0.0146	0.9629	-	-	-	0.0000	0.0000	-	0.0000	0.0000
China Eastern Air.	Merchants Bank	China Oilfield	China Petroleum	China Shipping	China Coal Energy	China Cosco	China Iron & Steel	China Life	China Railway
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
0.0000	-	-	0.0000	-	-	-	0.0000	0.0000	0.0000
China Shenhua	China Shipping Dev	China Southern Air.	CITIC	Datang Int.	Dongfang Int.	Guanzhou Shipyard	Guashen Int.	Hisense	Huanneng
-	-	-	0.2515	-	-	-	0.0083	0.0471	0.0196
0.0046	-	-	0.1813	-	-	-	0.0047	0.0914	-
0.0563	-	-	0.0894	-	-	-	-	0.1496	-
0.0967	-	-	-	-	-	-	-	0.2372	-
0.1411	-	-	-	-	-	0.0035	-	0.3529	-
0.1610	-	-	-	-	-	0.0001	-	0.4790	-
0.1744	-	-	-	-	-	-	-	0.6067	-
0.1829	-	-	-	-	-	-	-	0.7345	-
0.1338	-	-	-	-	-	-	-	0.8662	-
-	-	0.0000	0.0000	0.0000	-	-	-	1.0000	0.0000
Hudan	ICBC	Jiangsu Exp.	Jiangxi Copper	Jingwei Textile	Luoyang Glass	NorthEast Electric	North Electric Dev	PetroChina	Ping An
-	0.0887	0.0039	-	0.0025	-	-	-	0.1884	-
-	0.1691	0.0178	-	-	-	-	-	0.1407	-
-	0.2258	-	-	-	-	-	-	0.0503	-
-	0.1674	-	-	-	0.0055	-	-	-	-
-	0.0205	-	-	-	0.0115	-	-	-	-
-	-	-	-	-	0.0047	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-
0.0000	0.0000	0.0000	-	0.0000	-	0.0000	-	-	0.0000
Shangdong Cheming	Shangdong Pharma	Shenji Group	Shenzhen Expressway	Sinopec Shanghai	Sinopec Chemical	Tianjin Capital	Tsingtao	Weichai Power	Yanzhou Mining
-	-	-	-	0.0191	-	-	0.0707	-	-
-	-	-	-	-	-	-	0.0971	-	-
-	-	-	-	-	-	-	0.1253	-	-
-	-	-	-	-	-	-	0.1460	-	-
-	-	-	-	-	-	-	0.1498	-	-
-	-	-	-	-	-	-	0.1333	-	-
-	-	-	-	-	-	-	0.1115	-	-
-	-	-	-	-	-	-	0.0826	-	-
-	-	-	-	-	-	-	-	-	-
-	0.0000	0.0000	0.0000	-	-	-	0.0000	0.0000	0.0000
Zijin Mining									
0.0116									
-									
-									
-									
-									
-									
-									
-									
0.0000									

4.19. Principal component analysis

4.19.1. Introduction

A Principal Component Analysis (PCA) is a frequently used technique to analyze multidimensional problems like stock returns (dual listed spreads) and other macro variables such as SHIBOR (Chinese equivalent of LIBOR) and CPI. The main objective of the principal component analysis is reducing the amount of variables to a set of factors (while not losing too much information when doing so). Most of the main variables frequently mentioned by market participants (particularly traders) were used in this section. Apart from stock spreads the other variables included were CPI, SHIBOR (that is the Chinese LIBOR and that is commonly referred by market participants as an indication of market liquidity), M2, gross output value of industry, buildings started (in recent years the real estate sector had a considerable impact in the market and hence it seems reasonable to include some indicators reflecting the performance of this sector), consumer confidence, CPI food (inflation in food products as a rice and meet prices, particularly pig meat, is frequently mentioned in the media and it is interesting analyzing its impact), export and import prices (the exports sector in China is a rather important one) and PMI (that is one of the most commonly mentioned macroeconomic figures impacting the Chinese stock market).

Given the availability of macro figures the analysis was performed on a monthly basis rather than on a daily basis. Ideally the analysis would be performed on a daily basis but data such as CPI is not available on a daily basis. GDP growth was excluded from this analysis given that the GDP is only reported on a quarterly basis and this seems too long of a period (the stock market can change dramatically in one quarter). Clearly it is possible, and likely, that a surprise (positive or negative) regarding GDP figures could move the market on that specific day/period. This is an unavoidable limitation of the data. The analysis was performed for all dual listed companies. Below the results for a few selected examples can be found (the analysis was performed for every dual listed company).

4.17.2 Analysis results - PetroChina

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	policy rate effective	CPI	CPI food	Export price	Import price	PMI
Correlation	Stocks spread	1.000	.010	.341	-.148	-.066	-.242	-.147	.074	.056	.078	.124	-.002	-.489
	SHIBOR 3M5	.010	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.341	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.148	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	-.066	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	-.242	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	-.147	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	policy rate effective	.074	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.056	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.078	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.124	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price	-.002	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.489	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.478	.023	.199	.353	.081	.199	.336	.375	.328	.239	.496	.001
	SHIBOR 3M5	.478		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.023	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.199	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.353	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.081	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.199	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	policy rate effective	.336	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.375	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.328	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.239	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price	.496	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.001	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 3.131E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer conficence	policy rate effective	CPI	CPI food	Export price	Import price	PMI
Stocks spread	2.329	3.456	-.307	-2.883	-1.021	.092	.580	-1.900	6.771	-6.143	-2.601	-1.490	2.215
SHIBOR 3M5	3.456	30.260	4.970	-18.617	-6.929	4.943	2.529	-15.993	-15.546	-3.884	-14.343	7.894	6.004
CPI MOM	-.307	4.970	7.658	-5.390	.268	4.145	2.139	3.477	5.756	-19.303	-2.642	1.357	1.142
M2	-2.883	-18.617	-5.390	49.609	-1.351	-4.029	-.953	14.582	56.093	-31.969	30.390	-3.809	-11.305
Gross output value of industry	-1.021	-6.929	.268	-1.351	24.403	-.023	-.376	5.356	18.480	-16.989	-2.568	-22.552	-5.160
Buildings start	.092	4.943	4.145	-4.029	-.023	4.058	.029	-.384	-2.223	-6.053	-3.004	2.751	.330
Consumer conficence	.580	2.529	2.139	-.953	-.376	.029	3.527	2.131	12.214	-15.489	-.075	-3.171	1.233
policy rate effective	-1.900	-15.993	3.477	14.582	5.356	-.384	2.131	20.352	34.756	-35.333	10.983	-6.453	-3.126
CPI	6.771	-15.546	5.756	56.093	18.480	-2.223	12.214	34.756	577.959	-444.306	-19.579	-122.659	-8.473
CPI food	-6.143	-3.884	-19.303	-31.969	-16.989	-6.053	-15.489	-35.333	-444.306	387.053	14.020	88.022	2.300
Export price	-2.601	-14.343	-2.642	30.390	-2.568	-3.004	-.075	10.983	-19.579	14.020	33.496	8.719	-4.654
Import price	-1.490	7.894	1.357	-3.809	-22.552	2.751	-3.171	-6.453	-122.659	88.022	8.719	48.574	2.916
PMI	2.215	6.004	1.142	-11.305	-5.160	.330	1.233	-3.126	-8.473	2.300	-4.654	2.916	6.756

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.704
Bartlett's Test of Sphericity	Approx. Chi-Square	697.399
	Df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	policy rate effective	CPI	CPI food	Export price	Import price	PMI
Anti-image Covariance	Stocks spread	.429	.049	-.017	-.025	-.018	.010	.071	-.040	.005	-.007	-.033	-.013	.141
	SHIBOR 3M5	.049	.033	.021	-.012	-.009	.040	.024	-.026	-.001	.000	-.014	.005	.029
	CPI MOM	-.017	.021	.131	-.014	.001	.133	.079	.022	.001	-.007	-.010	.004	.022
	M2	-.025	-.012	-.014	.020	-.001	-.020	-.005	.014	.002	-.002	.018	-.002	-.034
	Gross output value of industry	-.018	-.009	.001	-.001	.041	.000	-.004	.011	.001	-.002	-.003	-.019	-.031
	Buildings start	.010	.040	.133	-.020	.000	.246	.002	-.005	-.001	-.004	-.022	.014	.012
	Consumer confidence	.071	.024	.079	-.005	-.004	.002	.284	.030	.006	-.011	-.001	-.019	.052
	policy rate effective	-.040	-.026	.022	.014	.011	-.005	.030	.049	.003	-.004	.016	-.007	-.023
	CPI	.005	-.001	.001	.002	.001	-.001	.006	.003	.002	-.002	-.001	-.004	-.002
	CPI food	-.007	.000	-.007	-.002	-.002	-.004	-.011	-.004	-.002	.003	.001	.005	.001
	Export price	-.033	-.014	-.010	.018	-.003	-.022	-.001	.016	-.001	.001	.030	.005	-.021
	Import price	-.013	.005	.004	-.002	-.019	.014	-.019	-.007	-.004	.005	.005	.021	.009
	PMI	.141	.029	.022	-.034	-.031	.012	.052	-.023	-.002	.001	-.021	.009	.148
Anti-image Correlation	Stocks spread	.359[a]	.412	-.073	-.268	-.135	.030	.202	-.276	.185	-.205	-.295	-.140	.558
	SHIBOR 3M5	.412	.734[a]	.327	-.480	-.255	.446	.245	-.644	-.118	-.036	-.451	.206	.420
	CPI MOM	-.073	.327	.474[a]	-.277	.020	.744	.412	.278	.087	-.355	-.165	.070	.159
	M2	-.268	-.480	-.277	.726[a]	-.039	-.284	-.072	.459	.331	-.231	.746	-.078	-.618
	Gross output value of industry	-.135	-.255	.020	-.039	.828[a]	-.002	-.041	.240	.156	-.175	-.090	-.655	-.402
	Buildings start	.030	.446	.744	-.284	-.002	.411[a]	.008	-.042	-.046	-.153	-.258	.196	.063
	Consumer confidence	.202	.245	.412	-.072	-.041	.008	.587[a]	.252	.271	-.419	-.007	-.242	.253
	policy rate effective	-.276	-.644	.278	.459	.240	-.042	.252	.726[a]	.320	-.398	.421	-.205	-.267
	CPI	.185	-.118	.087	.331	.156	-.046	.271	.320	.753[a]	-.939	-.141	-.732	-.136
	CPI food	-.205	-.036	-.355	-.231	-.175	-.153	-.419	-.398	-.939	.739[a]	.123	.642	.045
	Export price	-.295	-.451	-.165	.746	-.090	-.258	-.007	.421	-.141	.123	.793[a]	.216	-.309
	Import price	-.140	.206	.070	-.078	-.655	.196	-.242	-.205	-.732	.642	.216	.718[a]	.161
	PMI	.558	.420	.159	-.618	-.402	.063	.253	-.267	-.136	.045	-.309	.161	.464[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Stocks spread	1.000	.850
SHIBOR 3M5	1.000	.944
CPI MOM	1.000	.862
M2	1.000	.930
Gross output value of industry	1.000	.940
Buildings start	1.000	.813
Consumer conficence	1.000	.857
policy rate effective	1.000	.889
CPI	1.000	.987
CPI food	1.000	.962
Export price	1.000	.914
Import price	1.000	.920
PMI	1.000	.870

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.712	51.631	51.631	6.712	51.631	51.631
2	2.295	17.652	69.284	2.295	17.652	69.284
3	1.701	13.083	82.367	1.701	13.083	82.367
4	1.030	7.921	90.288	1.030	7.921	90.288
5	.465	3.576	93.863			
6	.318	2.449	96.312			
7	.270	2.073	98.385			
8	.100	.767	99.152			
9	.053	.408	99.560			
10	.027	.205	99.765			
11	.019	.146	99.911			
12	.011	.082	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component			
	1	2	3	4
Stocks spread	.109	-.612	.125	.669
SHIBOR 3M5	.902	-.143	-.160	-.290
CPI MOM	.302	-.401	.781	.001
M2	-.906	.169	.279	-.056
Gross output value of industry	.790	.431	.357	.049
Buildings start	-.093	.586	-.647	.205
Consumer conficence	.270	.724	.065	.505
policy rate effective	.815	-.208	-.338	-.260
CPI	.986	.102	.070	-.004
CPI food	.977	.059	.065	-.029
Export price	.937	-.100	-.162	.016
Import price	.847	.347	.255	.134
PMI	-.291	.685	.455	-.330

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	policy rate effective	CPI	CPI food	Export price	Import price	PMI
Reproduced Correlation	Stocks spread	.850[a]	-.027	.377	-.205	-.100	-.312	-.068	.001	.051	.059	.154	.002	-.615
	SHIBOR 3M5	-.027	.944[a]	.204	-.870	.580	-.124	-.017	.894	.864	.870	.881	.634	-.338
	CPI MOM	.377	.204	.862[a]	-.124	.344	-.768	-.157	.065	.311	.322	.196	.316	-.008
	M2	-.205	-.870	-.124	.930[a]	-.546	-.008	-.132	-.853	-.856	-.855	-.912	-.645	.525
	Gross output value of industry	-.100	.580	.344	-.546	.940[a]	-.042	.574	.421	.848	.819	.640	.916	.211
	Buildings start	-.312	-.124	-.768	-.008	-.042	.813[a]	.460	-.032	-.078	-.104	-.037	-.013	.066
	Consumer confidence	-.068	-.017	-.157	-.132	.574	.460	.857[a]	-.084	.343	.296	.179	.565	.280
	policy rate effective	.001	.894	.065	-.853	.421	-.032	-.084	.889[a]	.759	.769	.835	.496	-.448
	CPI	.051	.864	.311	-.856	.848	-.078	.343	.759	.987[a]	.973	.902	.887	-.184
	CPI food	.059	.870	.322	-.855	.819	-.104	.296	.769	.973	.962[a]	.898	.860	-.205
	Export price	.154	.881	.196	-.912	.640	-.037	.179	.835	.902	.898	.914[a]	.719	-.421
	Import price	.002	.634	.316	-.645	.916	-.013	.565	.496	.887	.860	.719	.920[a]	.062
	PMI	-.615	-.338	-.008	.525	.211	.066	.280	-.448	-.184	-.205	-.421	.062	.870[a]
Residual[b]	Stocks spread		.037	-.036	.058	.034	.071	-.079	.074	.005	.018	-.031	-.004	.126
	SHIBOR 3M5	.037		-.006	.049	.001	.003	.026	.039	-.004	.011	-.033	-.022	.017
	CPI MOM	-.036	-.006		.006	-.054	.111	.017	-.008	.022	.045	.019	-.068	-.006
	M2	.058	.049	.006		.006	.037	.001	.060	.004	.025	-.047	-.018	.029
	Gross output value of industry	.034	.001	-.054	.006		-.008	-.054	-.003	-.012	-.024	-.009	.037	.007
	Buildings start	.071	.003	.111	.037	-.008		-.090	.011	.029	.053	.011	-.046	.080
	Consumer confidence	-.079	.026	.017	.001	-.054	-.090		.026	-.011	.003	-.021	-.043	-.068
	policy rate effective	.074	.039	-.008	.060	-.003	.011	.026		-.003	.020	-.071	-.019	.051
	CPI	.005	-.004	.022	.004	-.012	.029	-.011	-.003		.017	-.001	-.010	.009
	CPI food	.018	.011	.045	.025	-.024	.053	.003	.020	.017		-.013	-.037	.023
	Export price	-.031	-.033	.019	-.047	-.009	.011	-.021	-.071	-.001	-.013		-.011	.005
	Import price	-.004	-.022	-.068	-.018	.037	-.046	-.043	-.019	-.010	-.037	-.011		-.024
	PMI	.126	.017	-.006	.029	.007	.080	-.068	.051	.009	.023	.005	-.024	

Extraction Method: Principal Component Analysis.

China Construction Bank

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Correlation	Stocks spread	1.000	.266	.266	-.195	.007	-.165	-.150	.268	.188	.216	.207	.080	-.378
	SHIBOR 3M5	.266	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.266	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.195	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	.007	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	-.165	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	-.150	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	.268	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.188	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.216	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.207	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price	.080	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.378	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.061	.061	.131	.483	.172	.194	.060	.140	.106	.116	.323	.013
	SHIBOR 3M5	.061		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.061	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.131	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.483	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.172	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.194	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.060	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.140	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.106	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.116	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price	.323	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.013	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 4.532E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Stocks spread	1.609	-.390	-.436	-2.570	1.231	-.325	.223	-.426	2.347	-1.698	-1.423	-2.285	1.059
SHIBOR 3M5	-.390	25.225	5.531	-13.716	-5.713	4.886	1.614	-13.070	-26.163	5.644	-10.138	10.658	2.461
CPI MOM	-.436	5.531	7.736	-5.073	-.200	4.245	2.155	3.342	6.011	-19.651	-2.599	1.781	1.146
M2	-2.570	-13.716	-5.073	50.145	-4.582	-3.396	-.591	12.910	60.726	-36.862	29.442	-2.003	-10.255
Gross output value of industry	1.231	-5.713	-.200	-4.582	24.899	-.231	.049	4.198	23.244	-20.981	-4.797	-24.955	-3.378
Buildings start	-.325	4.886	4.245	-3.396	-.231	4.120	-.038	-.223	-2.963	-5.468	-2.615	3.271	.029
Consumer confidence	.223	1.614	2.155	-.591	.049	-.038	3.413	2.545	10.853	-14.195	.376	-3.117	.829
Policy rate effective	-.426	-13.070	3.342	12.910	4.198	-.223	2.545	18.914	39.659	-39.896	9.238	-7.064	-1.600
CPI	2.347	-26.163	6.011	60.726	23.244	-2.963	10.853	39.659	561.699	-428.923	-14.092	-121.662	-13.366
CPI food	-1.698	5.644	-19.651	-36.862	-20.981	-5.468	-14.195	-39.896	-428.923	372.641	8.661	86.504	7.023
Export price	-1.423	-10.138	-2.599	29.442	-4.797	-2.615	.376	9.238	-14.092	8.661	31.849	9.076	-3.117
Import price	-2.285	10.658	1.781	-2.003	-24.955	3.271	-3.117	-7.064	-121.662	86.504	9.076	50.868	2.828
PMI	1.059	2.461	1.146	-10.255	-3.378	.029	.829	-1.600	-13.366	7.023	-3.117	2.828	5.348

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.721
Bartlett's Test of Sphericity	Approx. Chi-Square	686.730
	Df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Anti-image Covariance	Stocks spread	.622	-.010	-.035	-.032	.031	-.049	.041	-.014	.003	-.003	-.028	-.028	.123
	SHIBOR 3M5	-.010	.040	.028	-.011	-.009	.047	.019	-.027	-.002	.001	-.013	.008	.018
	CPI MOM	-.035	.028	.129	-.013	-.001	.133	.082	.023	.001	-.007	-.011	.005	.028
	M2	-.032	-.011	-.013	.020	-.004	-.016	-.003	.014	.002	-.002	.018	-.001	-.038
	Gross output value of industry	.031	-.009	-.001	-.004	.040	-.002	.001	.009	.002	-.002	-.006	-.020	-.025
	Buildings start	-.049	.047	.133	-.016	-.002	.243	-.003	-.003	-.001	-.004	-.020	.016	.001
	Consumer confidence	.041	.019	.082	-.003	.001	-.003	.293	.039	.006	-.011	.003	-.018	.045
	Policy rate effective	-.014	-.027	.023	.014	.009	-.003	.039	.053	.004	-.006	.015	-.007	-.016
	CPI	.003	-.002	.001	.002	.002	-.001	.006	.004	.002	-.002	-.001	-.004	-.004
	CPI food	-.003	.001	-.007	-.002	-.002	-.004	-.011	-.006	-.002	.003	.001	.005	.004
	Export price	-.028	-.013	-.011	.018	-.006	-.020	.003	.015	-.001	.001	.031	.006	-.018
	Import price	-.028	.008	.005	-.001	-.020	.016	-.018	-.007	-.004	.005	.006	.020	.010
	PMI	.123	.018	.028	-.038	-.025	.001	.045	-.016	-.004	.004	-.018	.010	.187
Anti-image Correlation	Stocks spread	.581[a]	-.061	-.124	-.286	.195	-.126	.095	-.077	.078	-.069	-.199	-.253	.361
	SHIBOR 3M5	-.061	.785[a]	.396	-.386	-.228	.479	.174	-.598	-.220	.058	-.358	.298	.212
	CPI MOM	-.124	.396	.445[a]	-.258	-.014	.752	.419	.276	.091	-.366	-.166	.090	.178
	M2	-.286	-.386	-.258	.738[a]	-.130	-.236	-.045	.419	.362	-.270	.737	-.040	-.626
	Gross output value of industry	.195	-.228	-.014	-.130	.821[a]	-.023	.005	.193	.197	-.218	-.170	-.701	-.293
	Buildings start	-.126	.479	.752	-.236	-.023	.393[a]	-.010	-.025	-.062	-.140	-.228	.226	.006
	Consumer confidence	.095	.174	.419	-.045	.005	-.010	.615[a]	.317	.248	-.398	.036	-.237	.194
	Policy rate effective	-.077	-.598	.276	.419	.193	-.025	.317	.744[a]	.385	-.475	.376	-.228	-.159
	CPI	.078	-.220	.091	.362	.197	-.062	.248	.385	.745[a]	-.938	-.105	-.720	-.244
	CPI food	-.069	.058	-.366	-.270	-.218	-.140	-.398	-.475	-.938	.735[a]	.079	.628	.157
	Export price	-.199	-.358	-.166	.737	-.170	-.228	.036	.376	-.105	.079	.822[a]	.225	-.239
	Import price	-.253	.298	.090	-.040	-.701	.226	-.237	-.228	-.720	.628	.225	.701[a]	.171
	PMI	.361	.212	.178	-.626	-.293	.006	.194	-.159	-.244	.157	-.239	.171	.536[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Stocks spread	1.000	.335
SHIBOR 3M5	1.000	.873
CPI MOM	1.000	.850
M2	1.000	.914
Gross output value of industry	1.000	.942
Buildings start	1.000	.799
Consumer confidence	1.000	.668
Policy rate effective	1.000	.827
CPI	1.000	.987
CPI food	1.000	.962
Export price	1.000	.908
Import price	1.000	.909
PMI	1.000	.705

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.758	51.982	51.982	6.758	51.982	51.982
2	2.232	17.168	69.151	2.232	17.168	69.151
3	1.689	12.990	82.140	1.689	12.990	82.140
4	.847	6.514	88.654			
5	.653	5.024	93.678			
6	.341	2.622	96.300			
7	.261	2.009	98.310			
8	.108	.830	99.139			
9	.053	.407	99.547			
10	.028	.216	99.762			
11	.018	.139	99.901			
12	.012	.091	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
Stocks spread	.255	-.518	.037
SHIBOR 3M5	.906	-.193	-.123
CPI MOM	.305	-.322	.809
M2	-.905	.157	.266
Gross output value of industry	.784	.477	.315
Buildings start	-.096	.534	-.710
Consumer confidence	.263	.773	-.030
Policy rate effective	.819	-.259	-.300
CPI	.984	.118	.062
CPI food	.976	.071	.062
Export price	.936	-.090	-.153
Import price	.842	.391	.215
PMI	-.298	.663	.420

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Reproduced Correlation	Stocks spread	.335[a]	.327	.274	-.303	-.035	-.328	-.334	.332	.193	.215	.280	.021	-.404
	SHIBOR 3M5	.327	.873[a]	.239	-.883	.580	-.103	.092	.829	.861	.863	.884	.661	-.449
	CPI MOM	.274	.239	.850[a]	-.112	.340	-.775	-.193	.090	.312	.325	.190	.305	.036
	M2	-.303	-.883	-.112	.914[a]	-.551	-.018	-.124	-.861	-.856	-.856	-.902	-.643	.485
	Gross output value of industry	-.035	.580	.340	-.551	.942[a]	-.044	.566	.424	.848	.819	.643	.915	.215
	Buildings start	-.328	-.103	-.775	-.018	-.044	.799[a]	.409	-.004	-.075	-.100	-.029	-.024	.085
	Consumer confidence	-.334	.092	-.193	-.124	.566	.409	.668[a]	.024	.348	.309	.181	.518	.422
	Policy rate effective	.332	.829	.090	-.861	.424	-.004	.024	.827[a]	.757	.762	.835	.524	-.541
	CPI	.193	.861	.312	-.856	.848	-.075	.348	.757	.987[a]	.973	.901	.889	-.188
	CPI food	.215	.863	.325	-.856	.819	-.100	.309	.762	.973	.962[a]	.898	.863	-.217
	Export price	.280	.884	.190	-.902	.643	-.029	.181	.835	.901	.898	.908[a]	.721	-.402
	Import price	.021	.661	.305	-.643	.915	-.024	.518	.524	.889	.863	.721	.909[a]	.099
	PMI	-.404	-.449	.036	.485	.215	.085	.422	-.541	-.188	-.217	-.402	.099	.705[a]
Residual[b]	Stocks spread		-.061	-.009	.108	.043	.163	.184	-.064	-.004	.001	-.072	.060	.026
	SHIBOR 3M5	-.061		-.041	.062	.001	-.018	-.083	.104	-.001	.018	-.037	-.049	.128
	CPI MOM	-.009	-.041		-.006	-.049	.118	.052	-.033	.020	.042	.025	-.057	-.050
	M2	.108	.062	-.006		.011	.047	-.007	.068	.004	.026	-.058	-.020	.069
	Gross output value of industry	.043	.001	-.049	.011		-.007	-.046	-.007	-.012	-.024	-.012	.038	.003
	Buildings start	.163	-.018	.118	.047	-.007		-.039	-.017	.027	.049	.003	-.035	.061
	Consumer confidence	.184	-.083	.052	-.007	-.046	-.039		-.082	-.016	-.010	-.024	.004	-.210
	Policy rate effective	-.064	.104	-.033	.068	-.007	-.017	-.082		.000	.027	-.072	-.046	.144
	CPI	-.004	-.001	.020	.004	-.012	.027	-.016	.000		.018	.000	-.012	.013
	CPI food	.001	.018	.042	.026	-.024	.049	-.010	.027	.018		-.013	-.041	.035
	Export price	-.072	-.037	.025	-.058	-.012	.003	-.024	-.072	.000	-.013		-.012	-.014
	Import price	.060	-.049	-.057	-.020	.038	-.035	.004	-.046	-.012	-.041	-.012		-.061
	PMI	.026	.128	-.050	.069	.003	.061	-.210	.144	.013	.035	-.014	-.061	

Extraction Method: Principal Component Analysis.

China Merchants

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Correlation	Stocks spread	1.000	.120	.215	-.196	.003	-.102	-.098	.142	.126	.140	.195	.058	-.371
	SHIBOR 3M5	.120	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.215	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.196	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	.003	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	-.102	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	-.098	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	.142	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.126	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.140	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.195	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price	.058	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.371	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.247	.107	.129	.493	.280	.287	.208	.235	.211	.131	.371	.014
	SHIBOR 3M5	.247		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.107	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.129	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.493	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.280	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.287	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.208	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.235	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.211	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.131	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price	.371	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.014	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 5.382E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Stocks spread	1.355	.717	-.289	-1.254	-.085	-.212	.227	-.539	2.792	-2.021	-1.261	-.995	.844
SHIBOR 3M5	.717	25.510	5.272	-15.002	-5.460	4.695	1.788	-13.459	-24.116	4.163	-11.151	9.578	3.165
CPI MOM	-.289	5.272	7.679	-5.502	.152	4.202	2.167	3.341	6.051	-19.681	-2.715	1.374	1.253
M2	-1.254	-15.002	-5.502	47.200	-2.536	-3.720	-.445	12.729	61.891	-37.704	28.337	-4.733	-9.345
Gross output value of industry	-.085	-5.460	.152	-2.536	23.961	.031	-.136	4.557	21.273	-19.554	-3.629	-23.143	-4.242
Buildings start	-.212	4.695	4.202	-3.720	.031	4.088	-.029	-.225	-2.925	-5.496	-2.705	2.965	.112
Consumer confidence	.227	1.788	2.167	-.445	-.136	-.029	3.420	2.514	10.996	-14.298	.361	-2.967	.823
Policy rate effective	-.539	-13.459	3.341	12.729	4.557	-.225	2.514	19.016	39.169	-39.541	9.363	-7.273	-1.656
CPI	2.792	-24.116	6.051	61.891	21.273	-2.925	10.996	39.169	564.031	-430.611	-14.616	-120.378	-13.171
CPI food	-2.021	4.163	-19.681	-37.704	-19.554	-5.496	-14.298	-39.541	-430.611	373.863	9.041	85.576	6.882
Export price	-1.261	-11.151	-2.715	28.337	-3.629	-2.705	.361	9.363	-14.616	9.041	31.765	7.982	-2.967
Import price	-.995	9.578	1.374	-4.733	-23.143	2.965	-2.967	-7.273	-120.378	85.576	7.982	48.352	3.713
PMI	.844	3.165	1.253	-9.345	-4.242	.112	.823	-1.656	-13.171	6.882	-2.967	3.713	5.176

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.720
Bartlett's Test of Sphericity	Approx. Chi-Square	681.774
	df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Anti-image Covariance	Stocks spread	.738	.021	-.028	-.020	-.003	-.038	.049	-.021	.004	-.004	-.029	-.015	.120
	SHIBOR 3M5	.021	.039	.027	-.012	-.009	.045	.020	-.028	-.002	.000	-.014	.008	.024
	CPI MOM	-.028	.027	.130	-.015	.001	.134	.083	.023	.001	-.007	-.011	.004	.032
	M2	-.020	-.012	-.015	.021	-.002	-.019	-.003	.014	.002	-.002	.019	-.002	-.038
	Gross output value of industry	-.003	-.009	.001	-.002	.042	.000	-.002	.010	.002	-.002	-.005	-.020	-.034
	Buildings start	-.038	.045	.134	-.019	.000	.245	-.002	-.003	-.001	-.004	-.021	.015	.005
	Consumer confidence	.049	.020	.083	-.003	-.002	-.002	.292	.039	.006	-.011	.003	-.018	.047
	Policy rate effective	-.021	-.028	.023	.014	.010	-.003	.039	.053	.004	-.006	.016	-.008	-.017
	CPI	.004	-.002	.001	.002	.002	-.001	.006	.004	.002	-.002	-.001	-.004	-.005
	CPI food	-.004	.000	-.007	-.002	-.002	-.004	-.011	-.006	-.002	.003	.001	.005	.004
	Export price	-.029	-.014	-.011	.019	-.005	-.021	.003	.016	-.001	.001	.031	.005	-.018
	Import price	-.015	.008	.004	-.002	-.020	.015	-.018	-.008	-.004	.005	.005	.021	.015
	PMI	.120	.024	.032	-.038	-.034	.005	.047	-.017	-.005	.004	-.018	.015	.193
Anti-image Correlation	Stocks spread	.586[a]	.122	-.090	-.157	-.015	-.090	.106	-.106	.101	-.090	-.192	-.123	.319
	SHIBOR 3M5	.122	.774[a]	.377	-.432	-.221	.460	.191	-.611	-.201	.043	-.392	.273	.275
	CPI MOM	-.090	.377	.439[a]	-.289	.011	.750	.423	.277	.092	-.367	-.174	.071	.199
	M2	-.157	-.432	-.289	.738[a]	-.075	-.268	-.035	.425	.379	-.284	.732	-.099	-.598
	Gross output value of industry	-.015	-.221	.011	-.075	.827[a]	.003	-.015	.214	.183	-.207	-.132	-.680	-.381
	Buildings start	-.090	.460	.750	-.268	.003	.391[a]	-.008	-.025	-.061	-.141	-.237	.211	.024
	Consumer confidence	.106	.191	.423	-.035	-.015	-.008	.609[a]	.312	.250	-.400	.035	-.231	.196
	Policy rate effective	-.106	-.611	.277	.425	.214	-.025	.312	.737[a]	.378	-.469	.381	-.240	-.167
	CPI	.101	-.201	.092	.379	.183	-.061	.250	.378	.743[a]	-.938	-.109	-.729	-.244
	CPI food	-.090	.043	-.367	-.284	-.207	-.141	-.400	-.469	-.938	.733[a]	.083	.636	.156
	Export price	-.192	-.392	-.174	.732	-.132	-.237	.035	.381	-.109	.083	.821[a]	.204	-.231
	Import price	-.123	.273	.071	-.099	-.680	.211	-.231	-.240	-.729	.636	.204	.707[a]	.235
	PMI	.319	.275	.199	-.598	-.381	.024	.196	-.167	-.244	.156	-.231	.235	.519[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Stocks spread	1.000	.232
SHIBOR 3M5	1.000	.862
CPI MOM	1.000	.851
M2	1.000	.924
Gross output value of industry	1.000	.938
Buildings start	1.000	.811
Consumer confidence	1.000	.666
Policy rate effective	1.000	.815
CPI	1.000	.987
CPI food	1.000	.961
Export price	1.000	.914
Import price	1.000	.906
PMI	1.000	.725

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.731	51.775	51.775	6.731	51.775	51.775
2	2.174	16.724	68.500	2.174	16.724	68.500
3	1.688	12.981	81.481	1.688	12.981	81.481
4	.986	7.588	89.069			
5	.588	4.522	93.590			
6	.337	2.591	96.181			
7	.269	2.068	98.249			
8	.114	.877	99.125			
9	.054	.413	99.539			
10	.028	.213	99.752			
11	.019	.146	99.898			
12	.012	.094	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
Stocks spread	.184	-.445	.003
SHIBOR 3M5	.902	-.187	-.114
CPI MOM	.301	-.305	.817
M2	-.906	.192	.257
Gross output value of industry	.789	.475	.302
Buildings start	-.092	.521	-.729
Consumer confidence	.269	.768	-.057
Policy rate effective	.815	-.258	-.290
CPI	.985	.112	.060
CPI food	.976	.068	.062
Export price	.937	-.116	-.147
Import price	.845	.387	.204
PMI	-.293	.691	.402

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Reproduced Correlation	Stocks spread	.232[a]	.249	.193	-.251	-.066	-.250	-.292	.264	.131	.149	.224	-.016	-.360
	SHIBOR 3M5	.249	.862[a]	.235	-.883	.589	-.096	.106	.817	.861	.861	.885	.667	-.439
	CPI MOM	.193	.235	.851[a]	-.122	.339	-.782	-.200	.088	.312	.324	.198	.303	.029
	M2	-.251	-.883	-.122	.924[a]	-.546	-.005	-.111	-.863	-.856	-.856	-.910	-.640	.501
	Gross output value of industry	-.066	.589	.339	-.546	.938[a]	-.045	.560	.433	.848	.821	.640	.912	.218
	Buildings start	-.250	-.096	-.782	-.005	-.045	.811[a]	.417	.002	-.076	-.099	-.039	-.024	.094
	Consumer confidence	-.292	.106	-.200	-.111	.560	.417	.666[a]	.037	.348	.311	.171	.513	.429
	Policy rate effective	.264	.817	.088	-.863	.433	.002	.037	.815[a]	.757	.760	.837	.530	-.534
	CPI	.131	.861	.312	-.856	.848	-.076	.348	.757	.987[a]	.973	.902	.889	-.187
	CPI food	.149	.861	.324	-.856	.821	-.099	.311	.760	.973	.961[a]	.898	.864	-.214
	Export price	.224	.885	.198	-.910	.640	-.039	.171	.837	.902	.898	.914[a]	.718	-.414
	Import price	-.016	.667	.303	-.640	.912	-.024	.513	.530	.889	.864	.718	.906[a]	.102
	PMI	-.360	-.439	.029	.501	.218	.094	.429	-.534	-.187	-.214	-.414	.102	.725[a]
Residual[b]	Stocks spread		-.129	.022	.055	.068	.148	.194	-.122	-.005	-.009	-.029	.074	-.010
	SHIBOR 3M5	-.129		-.037	.062	-.008	-.024	-.097	.116	-.001	.020	-.037	-.055	.118
	CPI MOM	.022	-.037		.004	-.048	.125	.059	-.031	.021	.044	.018	-.055	-.043
	M2	.055	.062	.004		.006	.033	-.020	.069	.004	.026	-.050	-.023	.053
	Gross output value of industry	.068	-.008	-.048	.006		-.006	-.040	-.015	-.013	-.025	-.009	.041	.000
	Buildings start	.148	-.024	.125	.033	-.006		-.047	-.023	.027	.048	.013	-.035	.052
	Consumer confidence	.194	-.097	.059	-.020	-.040	-.047		-.095	-.015	-.012	-.014	.008	-.217
	Policy rate effective	-.122	.116	-.031	.069	-.015	-.023	-.095		.000	.029	-.073	-.052	.137
	CPI	-.005	-.001	.021	.004	-.013	.027	-.015	.000		.018	-.001	-.012	.012
	CPI food	-.009	.020	.044	.026	-.025	.048	-.012	.029	.018		-.013	-.042	.032
	Export price	-.029	-.037	.018	-.050	-.009	.013	-.014	-.073	-.001	-.013		-.009	-.001
	Import price	.074	-.055	-.055	-.023	.041	-.035	.008	-.052	-.012	-.042	-.009		-.063
	PMI	-.010	.118	-.043	.053	.000	.052	-.217	.137	.012	.032	-.001	-.063	

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Correlation	Stocks spread	1.000	.010	.109	-.071	.022	-.012	-.023	.070	.041	.051	.054	.010	-.169
	SHIBOR 3M5	.010	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.109	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.071	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	.022	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	-.012	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	-.023	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	.070	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.041	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.051	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.054	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price	.010	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.169	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.477	.267	.343	.450	.472	.448	.345	.407	.386	.379	.477	.166
	SHIBOR 3M5	.477		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.267	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.343	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.450	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.472	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.448	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.345	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.407	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.386	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.379	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price	.477	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.166	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 6.155E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Stocks spread	1.185	1.186	-.336	-.408	-1.375	-.165	.008	-1.140	-1.434	1.468	-.191	1.079	.568
SHIBOR 3M5	1.186	26.317	5.090	-14.747	-6.791	4.642	1.676	-14.314	-27.030	6.702	-10.674	11.185	3.286
CPI MOM	-.336	5.090	7.712	-5.654	.523	4.204	2.214	3.549	7.053	-20.528	-2.930	.856	1.272
M2	-.408	-14.747	-5.654	46.180	-2.141	-3.859	-.238	12.623	64.970	-40.080	27.236	-6.026	-8.759
Gross output value of industry	-1.375	-6.791	.523	-2.141	25.551	.209	-.131	5.847	23.111	-21.384	-3.486	-24.457	-4.848
Buildings start	-.165	4.642	4.204	-3.859	.209	4.078	.006	-.150	-2.289	-6.016	-2.875	2.659	.164
Consumer confidence	.008	1.676	2.214	-.238	-.131	.006	3.382	2.596	10.518	-13.950	.571	-2.793	.686
Policy rate effective	-1.140	-14.314	3.549	12.623	5.847	-.150	2.596	19.899	41.661	-41.759	9.045	-8.708	-1.867
CPI	-1.434	-27.030	7.053	64.970	23.111	-2.289	10.518	41.661	560.009	-428.223	-11.785	-119.633	-15.599
CPI food	1.468	6.702	-20.528	-40.080	-21.384	-6.016	-13.950	-41.759	-428.223	372.668	6.922	85.429	8.845
Export price	-.191	-10.674	-2.930	27.236	-3.486	-2.875	.571	9.045	-11.785	6.922	30.621	6.881	-2.272
Import price	1.079	11.185	.856	-6.026	-24.457	2.659	-2.793	-8.708	-119.633	85.429	6.881	48.604	4.851
PMI	.568	3.286	1.272	-8.759	-4.848	.164	.686	-1.867	-15.599	8.845	-2.272	4.851	4.923

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.711
Bartlett's Test of Sphericity	Approx. Chi-Square	677.907
	df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Anti-image Covariance	Stocks spread	.844	.038	-.037	-.007	-.045	-.034	.002	-.048	-.002	.003	-.005	.019	.097
	SHIBOR 3M5	.038	.038	.025	-.012	-.010	.043	.019	-.027	-.002	.001	-.013	.009	.025
	CPI MOM	-.037	.025	.130	-.016	.003	.134	.085	.023	.002	-.007	-.012	.002	.034
	M2	-.007	-.012	-.016	.022	-.002	-.020	-.002	.014	.003	-.002	.019	-.003	-.039
	Gross output value of industry	-.045	-.010	.003	-.002	.039	.002	-.002	.011	.002	-.002	-.004	-.020	-.039
	Buildings start	-.034	.043	.134	-.020	.002	.245	.000	-.002	-.001	-.004	-.023	.013	.008
	Consumer confidence	.002	.019	.085	-.002	-.002	.000	.296	.039	.006	-.011	.006	-.017	.041
	Policy rate effective	-.048	-.027	.023	.014	.011	-.002	.039	.050	.004	-.006	.015	-.009	-.019
	CPI	-.002	-.002	.002	.003	.002	-.001	.006	.004	.002	-.002	-.001	-.004	-.006
	CPI food	.003	.001	-.007	-.002	-.002	-.004	-.011	-.006	-.002	.003	.001	.005	.005
	Export price	-.005	-.013	-.012	.019	-.004	-.023	.006	.015	-.001	.001	.033	.005	-.015
	Import price	.019	.009	.002	-.003	-.020	.013	-.017	-.009	-.004	.005	.005	.021	.020
	PMI	.097	.025	.034	-.039	-.039	.008	.041	-.019	-.006	.005	-.015	.020	.203
Anti-image Correlation	Stocks spread	.180[a]	.212	-.111	-.055	-.250	-.075	.004	-.235	-.056	.070	-.032	.142	.235
	SHIBOR 3M5	.212	.766[a]	.357	-.423	-.262	.448	.178	-.626	-.223	.068	-.376	.313	.289
	CPI MOM	-.111	.357	.424[a]	-.300	.037	.750	.433	.287	.107	-.383	-.191	.044	.206
	M2	-.055	-.423	-.300	.739[a]	-.062	-.281	-.019	.416	.404	-.306	.724	-.127	-.581
	Gross output value of industry	-.250	-.262	.037	-.062	.798[a]	.020	-.014	.259	.193	-.219	-.125	-.694	-.432
	Buildings start	-.075	.448	.750	-.281	.020	.387[a]	.002	-.017	-.048	-.154	-.257	.189	.037
	Consumer confidence	.004	.178	.433	-.019	-.014	.002	.618[a]	.316	.242	-.393	.056	-.218	.168
	Policy rate effective	-.235	-.626	.287	.416	.259	-.017	.316	.718[a]	.395	-.485	.366	-.280	-.189
	CPI	-.056	-.223	.107	.404	.193	-.048	.242	.395	.737[a]	-.937	-.090	-.725	-.297
	CPI food	.070	.068	-.383	-.306	-.219	-.154	-.393	-.485	-.937	.727[a]	.065	.635	.207
	Export price	-.032	-.376	-.191	.724	-.125	-.257	.056	.366	-.090	.065	.832[a]	.178	-.185
	Import price	.142	.313	.044	-.127	-.694	.189	-.218	-.280	-.725	.635	.178	.697[a]	.314
	PMI	.235	.289	.206	-.581	-.432	.037	.168	-.189	-.297	.207	-.185	.314	.478[a]

Communalities

	Initial	Extraction
Stocks spread	1.000	.944
SHIBOR 3M5	1.000	.898
CPI MOM	1.000	.850
M2	1.000	.926
Gross output value of industry	1.000	.942
Buildings start	1.000	.836
Consumer confidence	1.000	.752
Policy rate effective	1.000	.844
CPI	1.000	.987
CPI food	1.000	.962
Export price	1.000	.914
Import price	1.000	.914
PMI	1.000	.719

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.706	51.582	51.582	6.706	51.582	51.582
2	2.073	15.945	67.527	2.073	15.945	67.527
3	1.688	12.981	80.508	1.688	12.981	80.508
4	1.022	7.860	88.369	1.022	7.860	88.369
5	.666	5.124	93.493			
6	.348	2.674	96.167			
7	.270	2.074	98.241			
8	.116	.896	99.137			
9	.053	.411	99.548			
10	.026	.203	99.751			
11	.019	.144	99.895			
12	.013	.097	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component			
	1	2	3	4
Stocks spread	.065	-.180	-.003	.953
SHIBOR 3M5	.902	-.218	-.113	-.150
CPI MOM	.297	-.296	.817	.084
M2	-.905	.205	.256	-.007
Gross output value of industry	.793	.470	.301	.040
Buildings start	-.088	.537	-.730	.081
Consumer confidence	.275	.796	-.059	.199
Policy rate effective	.815	-.293	-.288	-.106
CPI	.987	.101	.060	-.006
CPI food	.977	.056	.062	-.010
Export price	.936	-.126	-.147	-.013
Import price	.848	.390	.203	.040
PMI	-.284	.674	.401	-.153

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Reproduced Correlation	Stocks spread	.944[a]	-.045	.150	-.104	.004	-.023	.065	.006	.040	.043	.072	.023	-.287
	SHIBOR 3M5	-.045	.898[a]	.227	-.889	.573	-.126	.051	.848	.862	.864	.891	.652	-.426
	CPI MOM	.150	.227	.850[a]	-.120	.345	-.775	-.185	.084	.312	.323	.194	.306	.031
	M2	-.104	-.889	-.120	.926[a]	-.545	.001	-.102	-.870	-.856	-.857	-.910	-.636	.499
	Gross output value of industry	.004	.573	.345	-.545	.942[a]	-.033	.582	.418	.848	.819	.639	.919	.206
	Buildings start	-.023	-.126	-.775	.001	-.033	.836[a]	.462	-.026	-.077	-.101	-.043	-.010	.082
	Consumer confidence	.065	.051	-.185	-.102	.582	.462	.752[a]	-.013	.346	.307	.163	.539	.404
	Policy rate effective	.006	.848	.084	-.870	.418	-.026	-.013	.844[a]	.757	.763	.843	.514	-.528
	CPI	.040	.862	.312	-.856	.848	-.077	.346	.757	.987[a]	.973	.902	.888	-.187
	CPI food	.043	.864	.323	-.857	.819	-.101	.307	.763	.973	.962[a]	.899	.863	-.213
	Export price	.072	.891	.194	-.910	.639	-.043	.163	.843	.902	.899	.914[a]	.715	-.407
	Import price	.023	.652	.306	-.636	.919	-.010	.539	.514	.888	.863	.715	.914[a]	.097
	PMI	-.287	-.426	.031	.499	.206	.082	.404	-.528	-.187	-.213	-.407	.097	.719[a]
	Stocks spread		.055	-.042	.033	.018	.011	-.088	.064	.001	.007	-.018	-.013	.118
	SHIBOR 3M5	.055		-.029	.068	.008	.005	-.041	.085	-.002	.017	-.043	-.040	.105
	CPI MOM	-.042	-.029		.003	-.054	.118	.045	-.027	.021	.045	.022	-.058	-.045
	M2	.033	.068	.003		.005	.027	-.029	.077	.005	.027	-.049	-.027	.055
	Gross output value of industry	.018	.008	-.054	.005		-.017	-.063	.000	-.012	-.024	-.008	.034	.012
	Buildings start	.011	.005	.118	.027	-.017		-.093	.005	.028	.050	.017	-.049	.064
	Consumer confidence	-.088	-.041	.045	-.029	-.063	-.093		-.045	-.014	-.008	-.006	-.017	-.192
	Policy rate effective	.064	.085	-.027	.077	.000	.005	-.045		-.001	.026	-.079	-.037	.131
	CPI	.001	-.002	.021	.005	-.012	.028	-.014	-.001		.018	-.001	-.011	.012
	CPI food	.007	.017	.045	.027	-.024	.050	-.008	.026	.018		-.014	-.040	.031
	Export price	-.018	-.043	.022	-.049	-.008	.017	-.006	-.079	-.001	-.014		-.007	-.009
	Import price	-.013	-.040	-.058	-.027	.034	-.049	-.017	-.037	-.011	-.040	-.007		-.059
	PMI	.118	.105	-.045	.055	.012	.064	-.192	.131	.012	.031	-.009	-.059	

Ping An

Correlation Matrix[a]

		Stocks Spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	import price index	PMI
Correlation	Stocks Spread	1.000	.051	.043	-.093	-.079	.134	-.059	.097	.059	.084	.054	-.011	-.349
	SHIBOR 3M5	.051	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.043	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.093	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	-.079	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	.134	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	-.059	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	.097	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.059	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.084	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.054	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	import price index	-.011	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.349	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks Spread		.386	.403	.298	.325	.222	.368	.290	.369	.316	.380	.476	.020
	SHIBOR 3M5	.386		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.403	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.298	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.325	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.222	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.368	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.290	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.369	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.316	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.380	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	import price index	.476	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.020	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

Inverse of Correlation Matrix

	Stocks Spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	import price index	PMI
Stocks Spread	1.592	.208	.157	-.941	.580	-.630	.738	.646	4.638	-5.528	.387	-1.900	1.249
SHIBOR 3M5	.208	25.157	5.446	-14.461	-5.339	4.725	1.764	-13.088	-24.988	4.510	-10.432	9.856	2.881
CPI MOM	.157	5.446	7.633	-5.863	.191	4.095	2.289	3.290	7.106	-20.658	-2.946	.973	1.557
M2	-.941	-14.461	-5.863	46.596	-2.958	-3.543	-.671	11.848	61.734	-36.307	26.941	-4.531	-9.301
Gross output value of industry	.580	-5.339	.191	-2.958	24.168	-.212	.147	4.759	23.138	-21.696	-3.567	-23.898	-3.734
Buildings start	-.630	4.725	4.095	-3.543	-.212	4.304	-.285	-.565	-4.324	-3.624	-3.055	3.561	-.251
Consumer confidence	.738	1.764	2.289	-.671	.147	-.285	3.724	2.904	12.677	-16.522	.752	-3.681	1.261
Policy rate effective	.646	-13.088	3.290	11.848	4.759	-.565	2.904	19.064	42.164	-42.590	9.018	-8.440	-.813
CPI	4.638	-24.988	7.106	61.734	23.138	-4.324	12.677	42.164	571.785	-442.550	-10.889	-123.862	-11.274
CPI food	-5.528	4.510	-20.658	-36.307	-21.696	-3.624	-16.522	-42.590	-442.550	390.045	5.816	90.689	3.806
Export price	.387	-10.432	-2.946	26.941	-3.567	-3.055	.752	9.018	-10.889	5.816	30.685	6.594	-1.877
import price index	-1.900	9.856	.973	-4.531	-23.898	3.561	-3.681	-8.440	-123.862	90.689	6.594	49.888	2.843
PMI	1.249	2.881	1.557	-9.301	-3.734	-.251	1.261	-.813	-11.274	3.806	-1.877	2.843	5.629

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.714
Bartlett's Test of Sphericity	Approx. Chi-Square	686.432
	df	78
	Sig.	.000

Anti-image Matrices

		Stocks Spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	import price index	PMI
Anti-image Covariance	Stocks Spread	.628	.005	.013	-.013	.015	-.092	.124	.021	.005	-.009	.008	-.024	.139
	SHIBOR 3M5	.005	.040	.028	-.012	-.009	.044	.019	-.027	-.002	.000	-.014	.008	.020
	CPI MOM	.013	.028	.131	-.016	.001	.125	.081	.023	.002	-.007	-.013	.003	.036
	M2	-.013	-.012	-.016	.021	-.003	-.018	-.004	.013	.002	-.002	.019	-.002	-.035
	Gross output value of industry	.015	-.009	.001	-.003	.041	-.002	.002	.010	.002	-.002	-.005	-.020	-.027
	Buildings start	-.092	.044	.125	-.018	-.002	.232	-.018	-.007	-.002	-.002	-.023	.017	-.010
	Consumer confidence	.124	.019	.081	-.004	.002	-.018	.269	.041	.006	-.011	.007	-.020	.060
	Policy rate effective	.021	-.027	.023	.013	.010	-.007	.041	.052	.004	-.006	.015	-.009	-.008
	CPI	.005	-.002	.002	.002	.002	-.002	.006	.004	.002	-.002	-.001	-.004	-.004
	CPI food	-.009	.000	-.007	-.002	-.002	-.002	-.011	-.006	-.002	.003	.000	.005	.002
	Export price	.008	-.014	-.013	.019	-.005	-.023	.007	.015	-.001	.000	.033	.004	-.011
	import price index	-.024	.008	.003	-.002	-.020	.017	-.020	-.009	-.004	.005	.004	.020	.010
	PMI	.139	.020	.036	-.035	-.027	-.010	.060	-.008	-.004	.002	-.011	.010	.178
Anti-image Correlation	Stocks Spread	.277[a]	.033	.045	-.109	.094	-.241	.303	.117	.154	-.222	.055	-.213	.417
	SHIBOR 3M5	.033	.782[a]	.393	-.422	-.217	.454	.182	-.598	-.208	.046	-.375	.278	.242
	CPI MOM	.045	.393	.427[a]	-.311	.014	.714	.429	.273	.108	-.379	-.193	.050	.237
	M2	-.109	-.422	-.311	.749[a]	-.088	-.250	-.051	.398	.378	-.269	.712	-.094	-.574
	Gross output value of industry	.094	-.217	.014	-.088	.829[a]	-.021	.016	.222	.197	-.223	-.131	-.688	-.320
	Buildings start	-.241	.454	.714	-.250	-.021	.390[a]	-.071	-.062	-.087	-.088	-.266	.243	-.051
	Consumer confidence	.303	.182	.429	-.051	.016	-.071	.538[a]	.345	.275	-.433	.070	-.270	.275
	Policy rate effective	.117	-.598	.273	.398	.222	-.062	.345	.733[a]	.404	-.494	.373	-.274	-.078
	CPI	.154	-.208	.108	.378	.197	-.087	.275	.404	.738[a]	-.937	-.082	-.733	-.199
	CPI food	-.222	.046	-.379	-.269	-.223	-.088	-.433	-.494	-.937	.724[a]	.053	.650	.081
	Export price	.055	-.375	-.193	.712	-.131	-.266	.070	.373	-.082	.053	.835[a]	.169	-.143
	import price index	-.213	.278	.050	-.094	-.688	.243	-.270	-.274	-.733	.650	.169	.698[a]	.170
	PMI	.417	.242	.237	-.574	-.320	-.051	.275	-.078	-.199	.081	-.143	.170	.536[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Stocks Spread	1.000	.905
SHIBOR 3M5	1.000	.906
CPI MOM	1.000	.878
M2	1.000	.920
Gross output value of industry	1.000	.940
Buildings start	1.000	.847
Consumer confidence	1.000	.770
Policy rate effective	1.000	.866
CPI	1.000	.987
CPI food	1.000	.962
Export price	1.000	.912
import price index	1.000	.917
PMI	1.000	.752

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.706	51.588	51.588	6.706	51.588	51.588
2	2.107	16.206	67.794	2.107	16.206	67.794
3	1.742	13.404	81.198	1.742	13.404	81.198
4	1.007	7.746	88.944	1.007	7.746	88.944
5	.637	4.903	93.848			
6	.324	2.492	96.340			
7	.269	2.073	98.413			
8	.093	.716	99.128			
9	.054	.413	99.541			
10	.027	.208	99.749			
11	.019	.147	99.896			
12	.013	.096	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component			
	1	2	3	4
Stocks Spread	.072	-.323	-.319	.833
SHIBOR 3M5	.903	-.221	-.054	-.198
CPI MOM	.296	-.201	.811	.305
M2	-.905	.227	.208	.073
Gross output value of industry	.792	.506	.223	.083
Buildings start	-.086	.421	-.814	.007
Consumer confidence	.274	.769	-.198	.253
Policy rate effective	.815	-.313	-.215	-.240
CPI	.987	.105	.042	.035
CPI food	.977	.058	.047	.040
Export price	.936	-.134	-.111	-.072
import price index	.848	.406	.133	.124
PMI	-.286	.736	.325	-.152

Extraction Method: Principal Component Analysis.

a. 4 components extracted.

Reproduced Correlations

		Stocks Spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	import price index	PMI
Reproduced Correlation	Stocks Spread	.905[a]	-.011	.082	-.144	-.108	.124	.045	.029	.053	.070	.087	-.009	-.489
	SHIBOR 3M5	-.011	.906[a]	.207	-.893	.574	-.128	.037	.864	.858	.859	.895	.644	-.409
	CPI MOM	.082	.207	.878[a]	-.122	.339	-.767	-.156	.056	.316	.328	.192	.315	-.015
	M2	-.144	-.893	-.122	.920[a]	-.549	.005	-.096	-.871	-.858	-.859	-.906	-.639	.483
	Gross output value of industry	-.108	.574	.339	-.549	.940[a]	-.036	.583	.419	.846	.817	.643	.917	.206
	Buildings start	.124	-.128	-.767	.005	-.036	.847[a]	.463	-.029	-.075	-.097	-.047	-.009	.069
	Consumer confidence	.045	.037	-.156	-.096	.583	.463	.770[a]	-.036	.351	.313	.157	.550	.384
	Policy rate effective	.029	.864	.056	-.871	.419	-.029	-.036	.866[a]	.754	.759	.846	.506	-.497
	CPI	.053	.858	.316	-.858	.846	-.075	.351	.754	.987[a]	.974	.902	.889	-.197
	CPI food	.070	.859	.328	-.859	.817	-.097	.313	.759	.974	.962[a]	.899	.864	-.228
	Export price	.087	.895	.192	-.906	.643	-.047	.157	.846	.902	.899	.912[a]	.716	-.392
	import price index	-.009	.644	.315	-.639	.917	-.009	.550	.506	.889	.864	.716	.917[a]	.080
	PMI	-.489	-.409	-.015	.483	.206	.069	.384	-.497	-.197	-.228	-.392	.080	.752[a]
Residual[b]	Stocks Spread		.062	-.038	.051	.029	.010	-.104	.068	.005	.014	-.033	-.002	.140
	SHIBOR 3M5	.062		-.009	.072	.006	.008	-.028	.068	.002	.022	-.047	-.032	.088
	CPI MOM	-.038	-.009		.005	-.048	.111	.016	.001	.017	.040	.024	-.067	.001
	M2	.051	.072	.005		.009	.024	-.035	.078	.006	.029	-.053	-.024	.071
	Gross output value of industry	.029	.006	-.048	.009		-.014	-.064	-.001	-.011	-.022	-.012	.036	.013
	Buildings start	.010	.008	.111	.024	-.014		-.093	.008	.026	.046	.021	-.051	.077
	Consumer confidence	-.104	-.028	.016	-.035	-.064	-.093		-.022	-.019	-.014	.000	-.028	-.172
	Policy rate effective	.068	.068	.001	.078	-.001	.008	-.022		.003	.031	-.083	-.028	.100
	CPI	.005	.002	.017	.006	-.011	.026	-.019	.003		.017	-.001	-.012	.022
	CPI food	.014	.022	.040	.029	-.022	.046	-.014	.031	.017		-.014	-.041	.045
	Export price	-.033	-.047	.024	-.053	-.012	.021	.000	-.083	-.001	-.014		-.007	-.024
	import price index	-.002	-.032	-.067	-.024	.036	-.051	-.028	-.028	-.012	-.041	-.007		-.042
	PMI	.140	.088	.001	.071	.013	.077	-.172	.100	.022	.045	-.024	-.042	

ICBC

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Correlation	Stocks spread	1.000	.198	.081	-.198	-.010	-.044	-.149	.253	.150	.155	.178	.047	-.281
	SHIBOR 3M5	.198	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.081	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.198	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	-.010	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	-.044	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	-.149	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	.253	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.150	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.155	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.178	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price	.047	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.281	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.127	.322	.127	.478	.400	.196	.071	.195	.187	.153	.394	.051
	SHIBOR 3M5	.127		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.322	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.127	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.478	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.400	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.196	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.071	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.195	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.187	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.153	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price	.394	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.051	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 5.794E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Stocks spread	1.258	.842	-.163	-1.787	.036	-.096	.122	-1.182	-6.587	4.886	-.425	.777	.654
SHIBOR 3M5	.842	25.694	5.316	-15.534	-5.391	4.743	1.750	-13.964	-30.003	8.503	-10.767	10.624	3.155
CPI MOM	-.163	5.316	7.638	-5.538	.129	4.169	2.200	3.380	7.503	-20.747	-2.929	1.060	1.348
M2	-1.787	-15.534	-5.538	48.578	-2.665	-3.779	-.408	13.909	73.832	-46.515	27.773	-6.757	-9.492
Gross output value of industry	.036	-5.391	.129	-2.665	23.957	.015	-.118	4.490	21.261	-19.542	-3.720	-23.183	-4.171
Buildings start	-.096	4.743	4.169	-3.779	.015	4.062	-.003	-.218	-1.985	-6.185	-2.869	2.750	.193
Consumer confidence	.122	1.750	2.200	-.408	-.118	-.003	3.394	2.490	9.889	-13.486	.532	-2.725	.745
Policy rate effective	-1.182	-13.964	3.380	13.909	4.490	-.218	2.490	19.912	46.470	-44.937	9.260	-8.399	-1.934
CPI	-6.587	-30.003	7.503	73.832	21.261	-1.985	9.889	46.470	592.760	-452.027	-9.793	-122.394	-18.334
CPI food	4.886	8.503	-20.747	-46.515	-19.542	-6.185	-13.486	-44.937	-452.027	389.824	5.510	87.109	10.680
Export price	-.425	-10.767	-2.929	27.773	-3.720	-2.869	.532	9.260	-9.793	5.510	30.734	6.793	-2.401
Import price	.777	10.624	1.060	-6.757	-23.183	2.750	-2.725	-8.399	-122.394	87.109	6.793	48.101	4.737
PMI	.654	3.155	1.348	-9.492	-4.171	.193	.745	-1.934	-18.334	10.680	-2.401	4.737	4.990

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.710
Bartlett's Test of Sphericity	Approx. Chi-Square	679.646
	df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Anti-image Covariance	Stocks spread	.795	.026	-.017	-.029	.001	-.019	.029	-.047	-.009	.010	-.011	.013	.104
	SHIBOR 3M5	.026	.039	.027	-.012	-.009	.045	.020	-.027	-.002	.001	-.014	.009	.025
	CPI MOM	-.017	.027	.131	-.015	.001	.134	.085	.022	.002	-.007	-.012	.003	.035
	M2	-.029	-.012	-.015	.021	-.002	-.019	-.002	.014	.003	-.002	.019	-.003	-.039
	Gross output value of industry	.001	-.009	.001	-.002	.042	.000	-.001	.009	.001	-.002	-.005	-.020	-.035
	Buildings start	-.019	.045	.134	-.019	.000	.246	.000	-.003	-.001	-.004	-.023	.014	.010
	Consumer confidence	.029	.020	.085	-.002	-.001	.000	.295	.037	.005	-.010	.005	-.017	.044
	Policy rate effective	-.047	-.027	.022	.014	.009	-.003	.037	.050	.004	-.006	.015	-.009	-.019
	CPI	-.009	-.002	.002	.003	.001	-.001	.005	.004	.002	-.002	-.001	-.004	-.006
	CPI food	.010	.001	-.007	-.002	-.002	-.004	-.010	-.006	-.002	.003	.000	.005	.005
	Export price	-.011	-.014	-.012	.019	-.005	-.023	.005	.015	-.001	.000	.033	.005	-.016
	Import price	.013	.009	.003	-.003	-.020	.014	-.017	-.009	-.004	.005	.005	.021	.020
	PMI	.104	.025	.035	-.039	-.035	.010	.044	-.019	-.006	.005	-.016	.020	.200
Anti-image Correlation	Stocks spread	.504[a]	.148	-.053	-.229	.007	-.043	.059	-.236	-.241	.221	-.068	.100	.261
	SHIBOR 3M5	.148	.767[a]	.379	-.440	-.217	.464	.187	-.617	-.243	.085	-.383	.302	.279
	CPI MOM	-.053	.379	.424[a]	-.287	.010	.749	.432	.274	.112	-.380	-.191	.055	.218
	M2	-.229	-.440	-.287	.723[a]	-.078	-.269	-.032	.447	.435	-.338	.719	-.140	-.610
	Gross output value of industry	.007	-.217	.010	-.078	.828[a]	.001	-.013	.206	.178	-.202	-.137	-.683	-.381
	Buildings start	-.043	.464	.749	-.269	.001	.386[a]	-.001	-.024	-.040	-.155	-.257	.197	.043
	Consumer confidence	.059	.187	.432	-.032	-.013	-.001	.633[a]	.303	.220	-.371	.052	-.213	.181
	Policy rate effective	-.236	-.617	.274	.447	.206	-.024	.303	.717[a]	.428	-.510	.374	-.271	-.194
	CPI	-.241	-.243	.112	.435	.178	-.040	.220	.428	.725[a]	-.940	-.073	-.725	-.337
	CPI food	.221	.085	-.380	-.338	-.202	-.155	-.371	-.510	-.940	.719[a]	.050	.636	.242
	Export price	-.068	-.383	-.191	.719	-.137	-.257	.052	.374	-.073	.050	.832[a]	.177	-.194
	Import price	.100	.302	.055	-.140	-.683	.197	-.213	-.271	-.725	.636	.177	.702[a]	.306
	PMI	.261	.279	.218	-.610	-.381	.043	.181	-.194	-.337	.242	-.194	.306	.479[a]

Communalities

	Initial	Extraction
Stocks spread	1.000	.235
SHIBOR 3M5	1.000	.871
CPI MOM	1.000	.837
M2	1.000	.915
Gross output value of industry	1.000	.935
Buildings start	1.000	.833
Consumer confidence	1.000	.708
Policy rate effective	1.000	.828
CPI	1.000	.987
CPI food	1.000	.962
Export price	1.000	.908
Import price	1.000	.907
PMI	1.000	.671

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.735	51.810	51.810	6.735	51.810	51.810
2	2.160	16.618	68.429	2.160	16.618	68.429
3	1.700	13.080	81.509	1.700	13.080	81.509
4	.859	6.608	88.117			
5	.694	5.338	93.455			
6	.351	2.701	96.156			
7	.269	2.073	98.229			
8	.116	.894	99.123			
9	.053	.411	99.534			
10	.028	.216	99.750			
11	.019	.147	99.897			
12	.012	.096	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
Stocks spread	.198	-.420	-.141
SHIBOR 3M5	.905	-.214	-.084
CPI MOM	.297	-.222	.837
M2	-.906	.203	.228
Gross output value of industry	.787	.499	.257
Buildings start	-.089	.464	-.781
Consumer confidence	.267	.787	-.134
Policy rate effective	.819	-.305	-.255
CPI	.985	.114	.054
CPI food	.976	.071	.060
Export price	.937	-.118	-.127
Import price	.844	.408	.167
PMI	-.291	.688	.336

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Reproduced Correlation	Stocks spread	.235[a]	.281	.034	-.297	-.090	-.103	-.259	.326	.139	.155	.253	-.028	-.394
	SHIBOR 3M5	.281	.871[a]	.245	-.883	.584	-.114	.084	.827	.862	.863	.883	.663	-.439
	CPI MOM	.034	.245	.837[a]	-.123	.338	-.783	-.208	.097	.312	.324	.198	.299	.042
	M2	-.297	-.883	-.123	.915[a]	-.554	-.003	-.112	-.862	-.858	-.857	-.902	-.644	.480
	Gross output value of industry	-.090	.584	.338	-.554	.935[a]	-.039	.568	.427	.847	.819	.646	.911	.200
	Buildings start	-.103	-.114	-.783	-.003	-.039	.833[a]	.446	-.015	-.077	-.101	-.039	-.016	.083
	Consumer confidence	-.259	.084	-.208	-.112	.568	.446	.708[a]	.013	.346	.308	.174	.524	.419
	Policy rate effective	.326	.827	.097	-.862	.427	-.015	.013	.828[a]	.758	.762	.835	.525	-.534
	CPI	.139	.862	.312	-.858	.847	-.077	.346	.758	.987[a]	.973	.903	.888	-.190
	CPI food	.155	.863	.324	-.857	.819	-.101	.308	.762	.973	.962[a]	.899	.863	-.215
	Export price	.253	.883	.198	-.902	.646	-.039	.174	.835	.903	.899	.908[a]	.722	-.397
	Import price	-.028	.663	.299	-.644	.911	-.016	.524	.525	.888	.863	.722	.907[a]	.090
	PMI	-.394	-.439	.042	.480	.200	.083	.419	-.534	-.190	-.215	-.397	.090	.671[a]
Residual[b]	Stocks spread		-.082	.046	.099	.080	.058	.110	-.073	.010	.000	-.074	.075	.113
	SHIBOR 3M5	-.082		-.047	.062	-.003	-.007	-.075	.105	-.002	.018	-.036	-.051	.118
	CPI MOM	.046	-.047		.006	-.047	.126	.067	-.040	.021	.044	.018	-.051	-.056
	M2	.099	.062	.006		.014	.032	-.019	.069	.006	.027	-.057	-.018	.074
	Gross output value of industry	.080	-.003	-.047	.014		-.011	-.049	-.009	-.011	-.024	-.015	.042	.018
	Buildings start	.058	-.007	.126	.032	-.011		-.076	-.006	.029	.050	.013	-.043	.063
	Consumer confidence	.110	-.075	.067	-.019	-.049	-.076		-.071	-.013	-.009	-.017	-.002	-.207
	Policy rate effective	-.073	.105	-.040	.069	-.009	-.006	-.071		-.002	.027	-.072	-.047	.137
	CPI	.010	-.002	.021	.006	-.011	.029	-.013	-.002		.018	-.002	-.011	.015
	CPI food	.000	.018	.044	.027	-.024	.050	-.009	.027	.018		-.014	-.041	.033
	Export price	-.074	-.036	.018	-.057	-.015	.013	-.017	-.072	-.002	-.014		-.013	-.019
	Import price	.075	-.051	-.051	-.018	.042	-.043	-.002	-.047	-.011	-.041	-.013		-.052
	PMI	.113	.118	-.056	.074	.018	.063	-.207	.137	.015	.033	-.019	-.052	

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Correlation	Stocks spread	1.000	-.286	.033	.470	.252	.116	.479	-.422	-.099	-.099	-.348	.119	.731
	SHIBOR 3M5	-.286	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.033	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	.470	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	.252	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	.116	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer confidence	.479	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	-.422	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	-.099	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	-.099	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	-.348	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price	.119	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	.731	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.048	.426	.002	.072	.254	.002	.006	.285	.286	.020	.247	.000
	SHIBOR 3M5	.048		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.426	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.002	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.072	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.254	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer confidence	.002	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.006	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.285	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.286	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.020	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price	.247	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.000	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 1.672E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Stocks spread	4.361	-2.859	1.096	-1.293	1.483	.569	-1.196	4.065	13.830	-13.882	-.163	-3.117	-1.972
SHIBOR 3M5	-2.859	27.004	4.707	-13.491	-6.387	4.435	2.452	-15.837	-34.659	14.331	-10.376	12.148	4.010
CPI MOM	1.096	4.707	7.893	-6.095	.506	4.300	1.915	4.248	10.123	-23.601	-3.026	.378	.937
M2	-1.293	-13.491	-6.095	46.423	-3.054	-4.084	.120	11.025	60.377	-35.461	27.218	-4.730	-7.979
Gross output value of industry	1.483	-6.387	.506	-3.054	24.460	.211	-.529	5.906	26.150	-24.401	-3.764	-24.265	-4.860
Buildings start	.569	4.435	4.300	-4.084	.211	4.129	-.149	.221	-.685	-7.622	-2.923	2.403	-.014
Consumer confidence	-1.196	2.452	1.915	.120	-.529	-.149	3.710	1.489	6.735	-10.152	.617	-1.946	1.223
Policy rate effective	4.065	-15.837	4.248	11.025	5.906	.221	1.489	22.590	53.171	-53.284	8.709	-10.574	-3.157
CPI	13.830	-34.659	10.123	60.377	26.150	-.685	6.735	53.171	602.127	-470.464	-12.533	-128.212	-21.164
CPI food	-13.882	14.331	-23.601	-35.461	-24.401	-7.622	-10.152	-53.284	-470.464	415.033	7.678	94.014	14.417
Export price	-.163	-10.376	-3.026	27.218	-3.764	-2.923	.617	8.709	-12.533	7.678	30.597	7.172	-2.107
Import price	-3.117	12.148	.378	-4.730	-24.265	2.403	-1.946	-10.574	-128.212	94.014	7.172	49.849	5.742
PMI	-1.972	4.010	.937	-7.979	-4.860	-.014	1.223	-3.157	-21.164	14.417	-2.107	5.742	5.542

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.713
Bartlett's Test of Sphericity	Approx. Chi-Square	715.488
	df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Anti-image Covariance	Stocks spread	.229	-.024	.032	-.006	.014	.032	-.074	.041	.005	-.008	-.001	-.014	-.082
	SHIBOR 3M5	-.024	.037	.022	-.011	-.010	.040	.024	-.026	-.002	.001	-.013	.009	.027
	CPI MOM	.032	.022	.127	-.017	.003	.132	.065	.024	.002	-.007	-.013	.001	.021
	M2	-.006	-.011	-.017	.022	-.003	-.021	.001	.011	.002	-.002	.019	-.002	-.031
	Gross output value of industry	.014	-.010	.003	-.003	.041	.002	-.006	.011	.002	-.002	-.005	-.020	-.036
	Buildings start	.032	.040	.132	-.021	.002	.242	-.010	.002	.000	-.004	-.023	.012	-.001
	Consumer confidence	-.074	.024	.065	.001	-.006	-.010	.270	.018	.003	-.007	.005	-.011	.059
	Policy rate effective	.041	-.026	.024	.011	.011	.002	.018	.044	.004	-.006	.013	-.009	-.025
	CPI	.005	-.002	.002	.002	.002	.000	.003	.004	.002	-.002	-.001	-.004	-.006
	CPI food	-.008	.001	-.007	-.002	-.002	-.004	-.007	-.006	-.002	.002	.001	.005	.006
	Export price	-.001	-.013	-.013	.019	-.005	-.023	.005	.013	-.001	.001	.033	.005	-.012
	Import price	-.014	.009	.001	-.002	-.020	.012	-.011	-.009	-.004	.005	.005	.020	.021
	PMI	-.082	.027	.021	-.031	-.036	-.001	.059	-.025	-.006	.006	-.012	.021	.180
Anti-image Correlation	Stocks spread	.651[a]	-.263	.187	-.091	.144	.134	-.297	.410	.270	-.326	-.014	-.211	-.401
	SHIBOR 3M5	-.263	.763[a]	.322	-.381	-.249	.420	.245	-.641	-.272	.135	-.361	.331	.328
	CPI MOM	.187	.322	.424[a]	-.318	.036	.753	.354	.318	.147	-.412	-.195	.019	.142
	M2	-.091	-.381	-.318	.774[a]	-.091	-.295	.009	.340	.361	-.255	.722	-.098	-.497
	Gross output value of industry	.144	-.249	.036	-.091	.806[a]	.021	-.055	.251	.215	-.242	-.138	-.695	-.417
	Buildings start	.134	.420	.753	-.295	.021	.391[a]	-.038	.023	-.014	-.184	-.260	.168	-.003
	Consumer confidence	-.297	.245	.354	.009	-.055	-.038	.714[a]	.163	.142	-.259	.058	-.143	.270
	Policy rate effective	.410	-.641	.318	.340	.251	.023	.163	.705[a]	.456	-.550	.331	-.315	-.282
	CPI	.270	-.272	.147	.361	.215	-.014	.142	.456	.721[a]	-.941	-.092	-.740	-.366
	CPI food	-.326	.135	-.412	-.255	-.242	-.184	-.259	-.550	-.941	.709[a]	.068	.654	.301
	Export price	-.014	-.361	-.195	.722	-.138	-.260	.058	.331	-.092	.068	.841[a]	.184	-.162
	Import price	-.211	.331	.019	-.098	-.695	.168	-.143	-.315	-.740	.654	.184	.689[a]	.345
	PMI	-.401	.328	.142	-.497	-.417	-.003	.270	-.282	-.366	.301	-.162	.345	.541[a]

Communalities

	Initial	Extraction
Stocks spread	1.000	.820
SHIBOR 3M5	1.000	.857
CPI MOM	1.000	.835
M2	1.000	.937
Gross output value of industry	1.000	.923
Buildings start	1.000	.835
Consumer confidence	1.000	.706
Policy rate effective	1.000	.807
CPI	1.000	.987
CPI food	1.000	.962
Export price	1.000	.916
Import price	1.000	.892
PMI	1.000	.708

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.749	51.919	51.919	6.749	51.919	51.919
2	2.691	20.702	72.620	2.691	20.702	72.620
3	1.746	13.433	86.054	1.746	13.433	86.054
4	.712	5.481	91.534			
5	.357	2.747	94.281			
6	.335	2.576	96.857			
7	.188	1.448	98.305			
8	.114	.878	99.183			
9	.048	.368	99.551			
10	.026	.197	99.748			
11	.019	.147	99.895			
12	.013	.097	99.993			
13	.001	.007	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component		
	1	2	3
Stocks spread	-.240	.860	.150
SHIBOR 3M5	.909	-.175	-.016
CPI MOM	.292	-.004	.866
M2	-.917	.255	.174
Gross output value of industry	.772	.558	.129
Buildings start	-.093	.270	-.868
Consumer confidence	.248	.736	-.322
Policy rate effective	.827	-.311	-.161
CPI	.981	.154	.030
CPI food	.972	.123	.050
Export price	.943	-.135	-.093
Import price	.833	.441	.061
PMI	-.315	.763	.165

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price	PMI
Reproduced Correlation	Stocks spread	.820[a]	-.372	.057	.466	.314	.124	.525	-.490	-.098	-.120	-.356	.188	.757
	SHIBOR 3M5	-.372	.857[a]	.252	-.881	.602	-.119	.101	.808	.864	.861	.882	.679	-.423
	CPI MOM	.057	.252	.835[a]	-.118	.335	-.780	-.210	.103	.312	.326	.195	.294	.048
	M2	.466	-.881	-.118	.937[a]	-.543	.004	-.095	-.866	-.855	-.852	-.916	-.641	.512
	Gross output value of industry	.314	.602	.335	-.543	.923[a]	-.034	.560	.444	.847	.826	.641	.897	.204
	Buildings start	.124	-.119	-.780	.004	-.034	.835[a]	.455	-.021	-.077	-.101	-.044	-.012	.092
	Consumer confidence	.525	.101	-.210	-.095	.560	.455	.706[a]	.028	.347	.316	.164	.511	.430
	Policy rate effective	-.490	.808	.103	-.866	.444	-.021	.028	.807[a]	.758	.757	.837	.542	-.524
	CPI	-.098	.864	.312	-.855	.847	-.077	.347	.758	.987[a]	.974	.902	.887	-.186
	CPI food	-.120	.861	.326	-.852	.826	-.101	.316	.757	.974	.962[a]	.895	.867	-.204
	Export price	-.356	.882	.195	-.916	.641	-.044	.164	.837	.902	.895	.916[a]	.720	-.415
	Import price	.188	.679	.294	-.641	.897	-.012	.511	.542	.887	.867	.720	.892[a]	.084
	PMI	.757	-.423	.048	.512	.204	.092	.430	-.524	-.186	-.204	-.415	.084	.708[a]
Residual[b]	Stocks spread		.085	-.024	.004	-.062	-.008	-.046	.069	-.001	.021	.008	-.069	-.026
	SHIBOR 3M5	.085		-.054	.060	-.021	-.002	-.092	.124	-.003	.020	-.034	-.067	.101
	CPI MOM	-.024	-.054		.000	-.044	.124	.069	-.046	.021	.042	.020	-.046	-.062
	M2	.004	.060	.000		.003	.025	-.036	.073	.004	.021	-.044	-.022	.042
	Gross output value of industry	-.062	-.021	-.044	.003		-.016	-.040	-.027	-.012	-.030	-.010	.056	.015
	Buildings start	-.008	-.002	.124	.025	-.016		-.085	-5.120E-006	.028	.050	.018	-.048	.054
	Consumer confidence	-.046	-.092	.069	-.036	-.040	-.085		-.086	-.014	-.016	-.007	.011	-.218
	Policy rate effective	.069	.124	-.046	.073	-.027	-5.120E-006	-.086		-.002	.032	-.073	-.064	.127
	CPI	-.001	-.003	.021	.004	-.012	.028	-.014	-.002		.017	.000	-.010	.011
	CPI food	.021	.020	.042	.021	-.030	.050	-.016	.032	.017		-.010	-.044	.021
	Export price	.008	-.034	.020	-.044	-.010	.018	-.007	-.073	.000	-.010		-.012	-.001
	Import price	-.069	-.067	-.046	-.022	.056	-.048	.011	-.064	-.010	-.044	-.012		-.046
	PMI	-.026	.101	-.062	.042	.015	.054	-.218	.127	.011	.021	-.001	-.046	

Extraction Method: Principal Component Analysis.

a. Reproduced communalities

b. Residuals are computed between observed and reproduced correlations. There are 22 (28.0%) nonredundant residuals with absolute values greater than 0.05.

Bank of China

Correlation Matrix[a]

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer confidence	Policy rate effective	CPI	CPI food	Export price	Import price index	PMI
Correlation	Stocks spread	1.000	.356	.314	-.281	.284	-.124	-.050	.383	.365	.384	.291	.305	-.225
	SHIBOR 3M5	.356	1.000	.199	-.821	.581	-.121	.009	.933	.860	.881	.848	.612	-.321
	CPI MOM	.314	.199	1.000	-.118	.291	-.657	-.141	.057	.333	.368	.216	.248	-.014
	M2	-.281	-.821	-.118	1.000	-.540	.029	-.131	-.793	-.852	-.830	-.959	-.663	.554
	Gross output value of industry	.284	.581	.291	-.540	1.000	-.050	.519	.417	.836	.795	.631	.953	.218
	Buildings start	-.124	-.121	-.657	.029	-.050	1.000	.370	-.021	-.048	-.051	-.026	-.060	.146
	Consumer conficence	-.050	.009	-.141	-.131	.519	.370	1.000	-.058	.333	.299	.157	.522	.212
	Policy rate effective	.383	.933	.057	-.793	.417	-.021	-.058	1.000	.756	.789	.764	.478	-.397
	CPI	.365	.860	.333	-.852	.836	-.048	.333	.756	1.000	.991	.901	.877	-.175
	CPI food	.384	.881	.368	-.830	.795	-.051	.299	.789	.991	1.000	.885	.823	-.182
	Export price	.291	.848	.216	-.959	.631	-.026	.157	.764	.901	.885	1.000	.708	-.416
	Import price index	.305	.612	.248	-.663	.953	-.060	.522	.478	.877	.823	.708	1.000	.038
	PMI	-.225	-.321	-.014	.554	.218	.146	.212	-.397	-.175	-.182	-.416	.038	1.000
Sig. (1-tailed)	Stocks spread		.018	.033	.051	.049	.239	.388	.012	.016	.011	.045	.037	.097
	SHIBOR 3M5	.018		.126	.000	.000	.245	.479	.000	.000	.000	.000	.000	.030
	CPI MOM	.033	.126		.251	.045	.000	.210	.373	.025	.015	.107	.075	.468
	M2	.051	.000	.251		.000	.435	.227	.000	.000	.000	.000	.000	.000
	Gross output value of industry	.049	.000	.045	.000		.387	.001	.006	.000	.000	.000	.000	.104
	Buildings start	.239	.245	.000	.435	.387		.014	.452	.391	.385	.441	.367	.202
	Consumer conficence	.388	.479	.210	.227	.001	.014		.370	.025	.040	.183	.001	.111
	Policy rate effective	.012	.000	.373	.000	.006	.452	.370		.000	.000	.000	.002	.009
	CPI	.016	.000	.025	.000	.000	.391	.025	.000		.000	.000	.000	.157
	CPI food	.011	.000	.015	.000	.000	.385	.040	.000	.000		.000	.000	.147
	Export price	.045	.000	.107	.000	.000	.441	.183	.000	.000	.000		.000	.006
	Import price index	.037	.000	.075	.000	.000	.367	.001	.002	.000	.000	.000		.414
	PMI	.097	.030	.468	.000	.104	.202	.111	.009	.157	.147	.006	.414	

a. Determinant = 4.314E-011

Inverse of Correlation Matrix

	Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer conficence	Policy rate effective	CPI	CPI food	Export price	Import price index	PMI
Stocks spread	1.690	.839	-.793	-1.787	-.759	-.543	.343	-1.772	-.254	.821	-.467	-.819	1.039
SHIBOR 3M5	.839	25.546	5.032	-15.224	-5.791	4.538	1.838	-14.052	-25.721	5.640	-10.715	9.698	3.233
CPI MOM	-.793	5.032	7.989	-4.931	.490	4.412	2.055	4.058	6.767	-20.497	-2.765	1.546	.946
M2	-1.787	-15.224	-4.931	47.928	-1.812	-3.341	-.597	14.102	64.744	-40.443	27.664	-4.788	-9.662
Gross output value of industry	-.759	-5.791	.490	-1.812	24.297	.261	-.276	5.319	21.562	-20.050	-3.498	-22.837	-4.656
Buildings start	-.543	4.538	4.412	-3.341	.261	4.229	-.103	.260	-2.407	-6.075	-2.752	3.073	-.090
Consumer conficence	.343	1.838	2.055	-.597	-.276	-.103	3.452	2.245	10.476	-13.793	.478	-2.966	.892
Policy rate effective	-1.772	-14.052	4.058	14.102	5.319	.260	2.245	20.658	40.547	-41.206	9.351	-6.810	-2.409
CPI	-.254	-25.721	6.767	64.744	21.562	-2.407	10.476	40.547	558.313	-426.570	-11.946	-118.204	-15.067
CPI food	.821	5.640	-20.497	-40.443	-20.050	-6.075	-13.793	-41.206	-426.570	371.248	6.932	83.694	8.646
Export price	-.467	-10.715	-2.765	27.664	-3.498	-2.752	.478	9.351	-11.946	6.932	30.720	7.282	-2.468
Import price index	-.819	9.698	1.546	-4.788	-22.837	3.073	-2.966	-6.810	-118.204	83.694	7.282	48.019	3.829
PMI	1.039	3.233	.946	-9.662	-4.656	-.090	.892	-2.409	-15.067	8.646	-2.468	3.829	5.289

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.724
Bartlett's Test of Sphericity	Approx. Chi-Square	688.156
	df	78
	Sig.	.000

Anti-image Matrices

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer conficence	Policy rate effective	CPI	CPI food	Export price	Import price index	PMI
Anti-image Covariance	Stocks spread	.592	.019	-.059	-.022	-.018	-.076	.059	-.051	.000	.001	-.009	-.010	.116
	SHIBOR 3M5	.019	.039	.025	-.012	-.009	.042	.021	-.027	-.002	.001	-.014	.008	.024
	CPI MOM	-.059	.025	.125	-.013	.003	.131	.075	.025	.002	-.007	-.011	.004	.022
	M2	-.022	-.012	-.013	.021	-.002	-.016	-.004	.014	.002	-.002	.019	-.002	-.038
	Gross output value of industry	-.018	-.009	.003	-.002	.041	.003	-.003	.011	.002	-.002	-.005	-.020	-.036
	Buildings start	-.076	.042	.131	-.016	.003	.236	-.007	.003	-.001	-.004	-.021	.015	-.004
	Consumer confidence	.059	.021	.075	-.004	-.003	-.007	.290	.031	.005	-.011	.005	-.018	.049
	Policy rate effective	-.051	-.027	.025	.014	.011	.003	.031	.048	.004	-.005	.015	-.007	-.022
	CPI	.000	-.002	.002	.002	.002	-.001	.005	.004	.002	-.002	-.001	-.004	-.005
	CPI food	.001	.001	-.007	-.002	-.002	-.004	-.011	-.005	-.002	.003	.001	.005	.004
	Export price	-.009	-.014	-.011	.019	-.005	-.021	.005	.015	-.001	.001	.033	.005	-.015
	Import price index	-.010	.008	.004	-.002	-.020	.015	-.018	-.007	-.004	.005	.005	.021	.015
	PMI	.116	.024	.022	-.038	-.036	-.004	.049	-.022	-.005	.004	-.015	.015	.189
Anti-image Correlation	Stocks spread	.725[a]	.128	-.216	-.199	-.118	-.203	.142	-.300	-.008	.033	-.065	-.091	.348
	SHIBOR 3M5	.128	.781[a]	.352	-.435	-.232	.437	.196	-.612	-.215	.058	-.382	.277	.278
	CPI MOM	-.216	.352	.451[a]	-.252	.035	.759	.391	.316	.101	-.376	-.177	.079	.145
	M2	-.199	-.435	-.252	.738[a]	-.053	-.235	-.046	.448	.396	-.303	.721	-.100	-.607
	Gross output value of industry	-.118	-.232	.035	-.053	.824[a]	.026	-.030	.237	.185	-.211	-.128	-.669	-.411
	Buildings start	-.203	.437	.759	-.235	.026	.388[a]	-.027	.028	-.050	-.153	-.241	.216	-.019
	Consumer confidence	.142	.196	.391	-.046	-.030	-.027	.627[a]	.266	.239	-.385	.046	-.230	.209
	Policy rate effective	-.300	-.612	.316	.448	.237	.028	.266	.728[a]	.378	-.471	.371	-.216	-.230
	CPI	-.008	-.215	.101	.396	.185	-.050	.239	.378	.746[a]	-.937	-.091	-.722	-.277
	CPI food	.033	.058	-.376	-.303	-.211	-.153	-.385	-.471	-.937	.737[a]	.065	.627	.195
	Export price	-.065	-.382	-.177	.721	-.128	-.241	.046	.371	-.091	.065	.834[a]	.190	-.194
	Import price index	-.091	.277	.079	-.100	-.669	.216	-.230	-.216	-.722	.627	.190	.718[a]	.240
	PMI	.348	.278	.145	-.607	-.411	-.019	.209	-.230	-.277	.195	-.194	.240	.477[a]

a. Measures of Sampling Adequacy(MSA)

Communalities

	Initial	Extraction
Stocks spread	1.000	.289
SHIBOR 3M5	1.000	.875
CPI MOM	1.000	.843
M2	1.000	.919
Gross output value of industry	1.000	.944
Buildings start	1.000	.789
Consumer confidence	1.000	.722
Policy rate effective	1.000	.839
CPI	1.000	.985
CPI food	1.000	.961
Export price	1.000	.905
Import price index	1.000	.914
PMI	1.000	.688

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.866	52.814	52.814	6.866	52.814	52.814
2	2.098	16.142	68.955	2.098	16.142	68.955
3	1.708	13.137	82.092	1.708	13.137	82.092
4	.816	6.276	88.368			
5	.694	5.337	93.706			
6	.345	2.656	96.362			
7	.267	2.052	98.414			
8	.093	.717	99.132			
9	.053	.411	99.543			
10	.027	.208	99.751			
11	.019	.146	99.897			
12	.012	.095	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.866	52.814	52.814	6.866	52.814	52.814
2	2.098	16.142	68.955	2.098	16.142	68.955
3	1.708	13.137	82.092	1.708	13.137	82.092
4	.816	6.276	88.368			
5	.694	5.337	93.706			
6	.345	2.656	96.362			
7	.267	2.052	98.414			
8	.093	.717	99.132			
9	.053	.411	99.543			
10	.027	.208	99.751			
11	.019	.146	99.897			
12	.012	.095	99.992			
13	.001	.008	100.000			

Extraction Method: Principal Component Analysis.

Reproduced Correlations

		Stocks spread	SHIBOR 3M5	CPI MOM	M2	Gross output value of industry	Buildings start	Consumer conficence	Policy rate effective	CPI	CPI food	Export price	Import price index	PMI
Reproduced Correlation	Stocks spread	.289[a]	.416	.369	-.378	.280	-.314	-.099	.367	.405	.414	.394	.304	-.211
	SHIBOR 3M5	.416	.875[a]	.236	-.885	.575	-.105	.076	.837	.858	.860	.883	.654	-.453
	CPI MOM	.369	.236	.843[a]	-.104	.345	-.760	-.199	.098	.310	.323	.180	.305	.045
	M2	-.378	-.885	-.104	.919[a]	-.542	-.017	-.107	-.869	-.851	-.851	-.902	-.634	.493
	Gross output value of industry	.280	.575	.345	-.542	.944[a]	-.031	.579	.421	.848	.820	.637	.919	.210
	Buildings start	-.314	-.105	-.760	-.017	-.031	.789[a]	.440	-.022	-.066	-.092	-.022	-.008	.092
	Consumer confidence	-.099	.076	-.199	-.107	.579	.440	.722[a]	-.001	.350	.310	.172	.534	.436
	Policy rate effective	.367	.837	.098	-.869	.421	-.022	-.001	.839[a]	.758	.764	.840	.519	-.547
	CPI	.405	.858	.310	-.851	.848	-.066	.350	.758	.985[a]	.972	.896	.888	-.189
	CPI food	.414	.860	.323	-.851	.820	-.092	.310	.764	.972	.961[a]	.893	.864	-.217
	Export price	.394	.883	.180	-.902	.637	-.022	.172	.840	.896	.893	.905[a]	.713	-.406
	Import price index	.304	.654	.305	-.634	.919	-.008	.534	.519	.888	.864	.713	.914[a]	.100
	PMI	-.211	-.453	.045	.493	.210	.092	.436	-.547	-.189	-.217	-.406	.100	.688[a]
Residual[b]	Stocks spread		-.060	-.054	.097	.004	.190	.049	.017	-.040	-.031	-.103	.001	-.014
	SHIBOR 3M5	-.060		-.037	.064	.006	-.016	-.067	.096	.002	.021	-.035	-.042	.131
	CPI MOM	-.054	-.037		-.013	-.055	.103	.058	-.041	.023	.044	.035	-.057	-.059
	M2	.097	.064	-.013		.002	.045	-.024	.076	-.001	.021	-.057	-.029	.061
	Gross output value of industry	.004	.006	-.055	.002		-.019	-.060	-.004	-.012	-.025	-.006	.033	.009
	Buildings start	.190	-.016	.103	.045	-.019		-.070	.000	.018	.041	-.004	-.051	.054
	Consumer confidence	.049	-.067	.058	-.024	-.060	-.070		-.057	-.017	-.011	-.015	-.013	-.224
	Policy rate effective	.017	.096	-.041	.076	-.004	.000	-.057		-.002	.025	-.077	-.041	.150
	CPI	-.040	.002	.023	-.001	-.012	.018	-.017	-.002		.019	.005	-.011	.014
	CPI food	-.031	.021	.044	.021	-.025	.041	-.011	.025	.019		-.008	-.041	.034
	Export price	-.103	-.035	.035	-.057	-.006	-.004	-.015	-.077	.005	-.008		-.005	-.010
	Import price index	.001	-.042	-.057	-.029	.033	-.051	-.013	-.041	-.011	-.041	-.005		-.062
	PMI	-.014	.131	-.059	.061	.009	.054	-.224	.150	.014	.034	-.010	-.062	

4.19.2. Discussion

The principal component analysis results are rather interesting. For instance in the case of China Construction Bank four factors managed to explain nearly 89% of the variance and five factors explains 93%.

Extraction values for "stock spread", which is the category in what we are most interested, for all the companies analyzed but three were above 0.82 suggesting that CPI (with the chosen variables) is an appropriate tool for most dual listed companies. A four-factor model seems to work better than a three-factor model. There random companies, China Merchants Bank, ICBC and Bank of China, were modeled with a three-factor model (rather than a four-factor model) and the results were not satisfactory. Those companies (modeled with a three factors model) had a very low extraction values for the stock spread category (around 0.23). The only exception was Bank of Communications with an extraction value of 0.820 for "Stocks spread" with a three component model.

Interestingly money supply was found to have little correlation with the others economic variables analyzed with perhaps two exceptions: 1) new buildings started and 2) consumer confidence. For instance the correlation with inflation is almost non-existent for the period analyzed. A higher correlation between CPI and money supply was expected. Perhaps this point illustrates one of the current issues in the Chinese economy. It has been argued by many markets participants, including the Chinese central bank that a large proportion of the amount of liquidity pumped to by the PBoC in the economy is not impacting the real economy. The process is rather simple. The central bank pumps liquidity into the banking system (for instance through reverse repo operations). Banks rather than lending this capital out to business and corporations use it to fund (in some cases through off-balance-sheet arrangements) property developers, which in many cases are paying considerably high rates for that funding. It should be noted that China has in recent years cope with the issue of excess capacity in several resources sectors such as steel and cement and that as a result, while the real estate sector has continued to expand the prices of related raw materials have not increased accordingly. Another important factor to take into account is the behavior and investment opportunities of Chinese retail investors. For a long period of time the deposit rate paid by banks to retail investors has been rather low (below inflation rate) and the results of the stock market in recent years have been also rather poor. As a consequence, a relatively

large amount of retail investors use the property market as their bank i.e. property prices have dramatically increased in China over the last decade. Hence, it is not very surprising seeing some degree of correlation between newly started buildings and consumer confidence.

There are some characteristics that deserve further comments. For instance, most corporate seem to have a first component positively related to CPI (no big difference when compared with CPI food) as well as import, export prices and SHIBOR 3M5 while apparently negatively related to M2. Also, for this first component, the category "building started" seems to be largely insignificant. For instance, in the case of PetroChina the component values obtained for CPI, import prices, export prices, SHIBOR 3M5 were 0.986, 0.847, 0.937 and 0.9052 respectively while the component value for M2 was a negative 0.906

The second component is highly positively related to consumer confidence and PMI and to a lesser degree to gross output value of industry and buildings started. These indicators seem to be consistent with a situation in which the economy is growing or at least it is perceived to be growing by the Chinese middle class (the dominant economic indicators for this component is clearly consumer confidence).

2nd Component (main features)				
Company	**Goss output value of industry**	**Buildings start**	**Consumer Confidence**	**PMI**
NE Elec Dev	0.472	0.543	0.804	0.660
PetroChina	0.431	0.586	0.724	0.685
Luoyang Glass	0.470	0.537	0.796	0.674
Ping An	0.506	0.421	0.769	0.736

The third component is highly related to CPI and to a lesser extent to gross output value of industry and PMI. This third component is strongly negatively relate to the amount of new buildings started (and also but to a lesser degree of the effective policy rate). This term is difficult to interpret on fundamentals. High CPI (inflation) could be related to an economy experiencing issues while buildings stated are not necessarily associated with a strong or weak economy. A few years ago inflation was a concern for the Chinese authorities and there were a lot of comments about the economy overheating. This has changed in the last couple of years with most of the talk among economists now regarding the slowdown in the economy and possible property bubbles in the market. Over the last few years there has been

little inflation and a considerable amount of new building started.

3rd Component (main features)					
Company	**CPI MOM**	**Gross Output Value of Industry**	**Buildings Start**	**Effective Policy Rate**	**PMI**
NE Elec Dev	0.830	0.290	-0.710	-0.311	0.362
PetroChina	0.781	0.357	-0.647	-0.338	0.455
Luoyang Glass	0.817	0.301	-0.730	-0.288	0.401
Ping An	0.811	0.223	-0.814	-0.215	0.325

The fourth component is also rather interesting showing the same characteristics in most of the analyzed stocks. The fourth component tends to be heavily related to stock spreads. The other three significant variables are: consumer confidence, PMI and SHIBOR. Consumer confidence seems to be positively related while PMI and SHIBOR 3M5 seems to be negatively related. It is not trivial interpreting this relationship. Everything else constant, a large consumer confidence rate and a lower SHIBOR could be associated by a relatively positive economic situation. On the other hand, an inverse relationship with PMI should suggest the contrary. China remains considerably dependent on the manufacturing sector and market participants typically consider a low PMI figure as a sell indication. Perhaps the nature of the typical investor in the A-share and H-share market can partially explain this. Consumer confidence is associated with mainland population, which is therefore associated with A-share investors. PMI and SHIBOR are economic indicators followed by institutional investors both in the mainland and Hong Kong. SHIBOR is also a very well-known indicator among retail investors. PMI, while popular, is perhaps a less well known indicator among retail investors. Following this logic it is plausible that this difference in perception of the important of the PMI value could create an asymmetry in the reaction of these two groups of investors (mainland China retail investors and institutional Hong Kong/overseas investors). The low value in the relative relation could account for the fact that a substantial amount of retail investors do know the PMI indicator.

4th Component (main features)				
Company	**Stock spread**	**Consumer Confidence**	**PMI**	**SHIBOR 3M5**
NE Elec Dev	0.822	0.237	-0.437	-0.195
PetroChina	0.669	0.505	-0.330	-0.290
Luoyang Glass	0.953	0.199	-0.153	-0.150
Ping An	0.833	0.253	-0.152	-0.198

4.20. Chapter Conclusions

The results of the analysis performed in Chapter 4 seem to indicate that the volatility in the A-share market is not necessarily higher than in the H-share market, at least for the period analyzed. It is commonly assumed that the volatility in the mainland market is higher as there are more retail investors (more heard behavior). The results clearly indicate that the volatility for the 12 months period analyzed was not higher in the A-share market than in the H-share. It should be noted that the results do not contradict the idea that there is significant heard behavior in the mainland market China it just indicates that it cannot we concluded that given any relatively long period of time (for instance one year) it can be assumed that the H-share market will have less volatility than its A-share counterparty. Multidimensional scaling techniques were used as a preprocessing tool. The main objective of this MDS analysis was to have a clearer picture about the clustering of the data as well as to be able to visualize (in a more comprehensible way) the large amount of data. Besides a few exceptions the bulk of the companies tend to strongly clustered.

A principal component analysis was also performed in this chapter. Including the following variables: Stock spreads, SHIBOR 3M5, CPI MOM, M2, buildings started, consumer confidence, effective policy rate, CPI, CPI food export price, import price and PMI. GDP, while clearly an important economic indicator was not included in the analysis because it is only released quarterly and this analysis was performed with monthly data. A principal component analysis was performed for all the dual listed companies but only selected companies are included in this report due to space constraints. A four-factor model seems to be the adequate one. For instance in the case of China Construction Bank a four-factor model explained more than 89% of the variance. The first component of the four-factor model seems to be positively related to CPI, import and export prices and negatively related to M2. So it seems related to an indication of price changes less the impact of increases in money supply. The second factor is positively related to consumer confidence and PMI (representing perhaps an indication of how the Chinese middle class perceive the economic situation). The third component is strongly related to CPI MOM and strongly negatively related to new buildings started. Fear of inflation has been one of the major issues in recent years in China. The focus has shifted over the last couple of years to fears of a property bubble bursting. It is interesting that this third component seems to be related to this concept. The fourth component, and perhaps the most difficult to interpret, is positively related to consumer

confidence and negatively related to PMI and SHIBOR 3M5. Consumer confidence is, obviously, a mainland China indicator (reflecting the feelings of the mainland population). Many mainland consumers are also retail (A-share) investors. PMI and SHIBOR are indicators followed by institutional investors (a considerable amount of retail investors also follow this index). If we take into account the larger proportion of institutional investors in the Hong Kong market (compared to the mainland market) then this fourth component could be related, at least to a certain extent, to the difference in perceptions between these two groups of investors.

Chapter 5. Two types of Stocks; Markov-switching Analysis

5.1. Introduction

In the previous chapter it was shown that there were indications of two types of stocks when analyzing dual listed companies; the large state-owned banks (and related companies) and the rest of corporations. In this chapter the difference between these two types of companies is quantified by using Markov-switching models (the analysis was performed for all dual listed companies). The expected durations of the big four state-owned banks (and related companies) are dramatically different from the durations of the rest of the companies. In fact, the expected duration for the large state-owned banks are infinite making very difficult for a trader to do an arbitrage on those stocks. This Markov-switching analysis was performed for all the dual listed companies. This chapter also include several case studies in important sectors such insurance, oil and aluminum. Markov-switching models seem to be a very useful tool to differentiate among these two types of companies.

While there are clearly an infinite amount of potential states in a Markov-switching model this analysis focus on a model with only two states, corresponding to a bullish and a bearish market. It is assumed that the median of the spread is not the same in the two states. This seems reasonable from a qualitative point of view. The data shows that spreads do fluctuate and (there are considerable differences among companies) and there is no obvious reason supporting the fact that the spread should be the same on a bull market that on a bearish market. Some market participants believe that the investors in Hong Kong and the mainland do not behave in the same way. They argued that as the proportion of institutional investors is higher in Hong Kong there is less heard behavior in this market. It seems reasonable to assume that if this is correct, when there is a sell-off in the A-share market (large amount of retails investors selling at the same time) volatility could be different than in a, for instance, bullish scenario i.e., it is believed by some market participants that the volatility in a sell of scenario could potentially be greater than in a bullish market (retail investors will react more strongly to bad news than to positive news). This qualitative framework is the reason why the states for the average spread and volatility are the same (it is easier in this way to achieve an interpretable result).

The Markov-switching model was successful on differentiating the behaviors of two types of very different companies namely the large state-owned banks and the rest of companies. From a fundamental point of view it is consistent that state-owned banks and the rest of the companies do not show the same type pattern. For instance, the risk of bankruptcy for these banks is arguably very low as they have the implicit back of the central Chinese government. The majority of mainland investors consider that the chance of an institution such as Bank of China or Agricultural Bank of China going bankrupt is almost non-existent and equal to the chance of the country going bankrupt. Historically, sovereign defaults in the country on currency are relatively rare (please note that this is not comparable to the situation in the EU were countries have debt in a currency that they do not control i.e. indebted countries cannot simply print more Euros). The issue of the residues is not the core of at the core of this section (ARCH effects are analyzed in depth in Chapter 6). The objective is gaining a better understanding of the major behavioral trends among different types of companies (more importantly between the large state-owned banks and other companies).

5.2. Model overview

There is a very good introduction to this topic in Hamilton's Time Series analysis. In this book, Hamilton presents the example of USD denominated accounts in Mexico (this example was first introduced by Rogers). The Mexican government tried to encourage the use of local currency and in order to do so introduced a series of measures to penalize the use of USD accounts. The result was a dramatic, an obvious change of regime. In our case, we will use such approach to analyze the behavior of dual listed Chinese companies.

Most of the articles covering this topic follow Hamilton notation (that it is also used in the Matlab application, by Perlin, to analyze the data). According to this notation a process can be described as being in one of two states:

$$Y_t=\mu_1+\varepsilon_1$$

$$Y_t=\mu_2+\varepsilon_2$$

(source: taken from Perlin)

These equations can be described in a more compact way as:

$$Y_t=\mu_1\delta_1+ \mu_2\delta_2+\varepsilon$$

If the process is in state 1 then the expected value would be μ_1 with a volatility σ_1. If the

process is in state 2 then the expected return is μ_2 and the expected volatility is σ_2 (this representation is also basically taken from Perlin). In order to estimate the parameters the maximum likelihood method was used.

Maximum likelihood Method

The Maximum Likelihood Estimation technique is a commonly used tool that can be defined as "way of obtaining estimators of a model when a specific distributional assumption is made about the vector sample observations" [Chang-Jin]. The following introduction of the MLM is mostly extracted from [Chang-Jin] book.

Given a set of observations

$$\bar{y}=[y_1,y_2,y_3\ldots,y_n]$$

of a process with parameters φ we can define the joint density function as:

$$P(\bar{y}|\ \varphi\ )$$

In many cases the parameters φ are not known while the observations are known and hence the density function is a function of y given φ. This function is called the likelihood function:

$$L(\varphi\ |\bar{y}\ )$$

Typically the function to maximize is the logarithm of the likelihood rather than the likelihood itself (so asymptotic covariance matrix can be calculated directly). As a result we have the estimator:

$$\widehat{\varphi}_{MLM}=\text{Argmax Ln}\{\ L(\varphi\ |\bar{y}\ )\}$$

The information matrix is defined as:

$$I(\varphi)=-E\left[\frac{\partial^2 \text{Ln } L(\varphi\ |\bar{y}\ )}{\partial\varphi\,\partial\varphi'}\right]$$

[Chang-Jin]

In the case of a Markov-switching process with two states the likelihood function is defined as:

$$\text{Ln } L=\sum_{t=1}^{T}\ln\left(\frac{1}{\sqrt{2\pi\sigma^2}}\exp\left(\frac{-\left(y_t-\mu_{\delta_t}\right)}{2\sigma^2}\right)\right)$$ [Perlin]

As just mentioned the expected values and variances for each state are not known. What we have is the likelihood of being in an state given certain parameter φ. Using Perlin notation:

$$\text{Ln L} = \sum_{t=1}^{T} \text{Ln} \sum_{j=1}^{2} \left(f(y_t | \delta_t = j, \varphi) P_r(\delta_t = j) \right)$$

5.3. Literature review

There are several studies regarding the application of Markov-switching model to the stock market. For instance [Taylor] applied this technique to the study of 40 stocks listed in the London Stock Exchange finding that the model fits well the data (including the different patterns expected in the different trading sessions). [Taylor] analysis does not cover dual listed companies and the frequency of the data is also different (analyzing stocks returns at 15 minutes intervals rather than daily returns). [Tyler, Scruggs] applied Markov-switching models to the expected returns of stocks and market liquidity. This is an interesting article showing indications that there exists a relationship between market liquidity and stocks returns (this is a point in which many market practitioners would agree).

This type of model has been applied to an enormous amount of stock markets and other financial instruments. For instance, Turkish stocks [Bildiric], S&P 100 [Marcucci], S&P 500 [Bauwens], Iranian Stocks [Naeini], G7 countries stock returns [Bhar], USD exchange rates [Klaessen], commodity options [Wu], UK, US and German interest rates [Ang], hedge fund strategies [Alexander], [Blazek], [Erlwein], hedge fund risk [Billio] US treasury bills [Kalimipalli], Argentinean Interest rates [Gruss], business cycles in the US [Bellone], US economic indicators ("Zero coupon Bond price index, USD Index, CBOE volatility index, Equity dividend yield, US interbank 3M interest rate, Treasury yield spread, US credit spread, S&P 500") [Mulvey], option valuation (both European and US style) [Bollen], Down Jones and NASDAQ indices [Dai], Brazilian demand for imports [Morais].

There are also some studies that use this technique to analyze the Chinese stock market. For instance [Liu] uses a Markov-switching model to study the stock returns of the Shanghai composite Index. [Liu] shows that Markov-switching models can be successfully applied to Chinese stocks. It is important to note that there are significant differences between the analysis performed by Liu and this report. Liu focuses on stock returns at an index level (rather than analyzing spreads between dual listed companies). Nevertheless, Liu's work shows that it is feasible analyzing Chinese stocks using this technique.

(Girardin and Liu) wrote an interesting article in 2005 analyzing the integration of the

Chinese A-share market and other major markets such as the US or Hong Kong through Markov-switching models. This article sows that there is indeed integration between those markets ("*our cointegration tests document the existence of a long run relationship between the Shanghai A-share market index and either the Standard and Poor's 500 or the Hang Seng index*" [Girardin, Liu]). This conclusion is very interesting because refutes several other articles stating that there is no significant integration between those market.

Another excellent article in this area is the one written by Zhou Qiao, Weiwei Qiao and Wing-Keung Qiao. They established that there are strong interdependencies between the A-share market and the B-share market ("*compared with the A-share markets, B-share markets stay in a high-volatility state longer and are more volatile and shift more frequently between high- and low-volatility states. In addition, the relative magnitude of the high-volatility compared with that of the low-volatility state in the B-share markets is much greater than the case in the two A-share markets. B-share markets are found to be more sensitive to international shocks, while A-share markets seem immune to international spillovers of volatility. Finally, analyses of the volatility spillover effect among the four stock markets indicate that the A-share markets play a dominant role in volatility in Chinese stock markets*" [Qiao]). The B-share market is a very interesting one and has evolved, over time, into what can be called as an abnormality, as mentioned in previous sections the B-share market was originally created to grant foreigners access to the PRC (mainland China) stock market. For a long period of time, PRC nationals were not allowed to buy such stocks (that restriction has been lifted). For roughly a decade, there have been no new IPO in this market and it is expected by many market participants that the market will disappear (eventually merging with the H-share market). It is believed that the low valuations in the B-share market are related to a liquidity penalty i.e., small market that is not traded frequently. In fact, a popular trade in recent times among investors is buying B-share speculating on the timing of the transfer to the H-share market (an expecting to get a considerable premium when this happens). This migration to the H-share market has, in fact, already started. CIMC was the first company to successfully transfer from the B-share market to the H-share market. The company offered a 5% cash premium that was not taken by the majority of the investors a they expected H-share liquidity to be worth more than a 5% premium (as in fact it was). Cash offer details can be found in Appendix 8 (directly taken from the company). The property developer Vanke (one of the largest Chinese companies) quickly followed and is in the

process of transferring its B-shares to the H-share market. Given these peculiarities extreme care must be taken when analyzing the B-share market.

Another relevant article is the one written by Mehmet Balcilar, Riza Demirer and Shawkat Mammoudeh. The authors use Markov-switching models to analyze the A-share and B-shares markets. They use a Markov-switching model to differentiate when the market is in a state of herding and when it is not. Interestingly, one of the conclusion of this article is that during periods of market distress there is an spill over herding effect from the A-share market (with a high concentration of retail investors) to the B-share market (foreign institutional). This seems to indicate that institutional investors (arguably more sophisticated) are impacted during market correction by the behavior of retail investors (arguably less sophisticated).

There are numerous articles analyzing the impact of herding behavior in the Chinese capital markets. For instance [Li Tan] supports the idea that there is significant herding behavior in the A-share market while there is much less evidence of such phenomena in the B-share market. [Li tan] also concludes that "*volatility seems to have more explanatory power than volume in explaining herding behavior*".

[Shuye Wang] showed that while H-share performance is affected by the performance of other Hong Kong stocks, it also remains influenced by the A-share market. "We find that H-shares exhibit significant exposure to Hong Kong market factors and behave more like Hong Kong Stocks than mainland Chinese stocks. However, H-shares retain significant exposure to their domestic market". Furthermore, [Shuye Wang] concludes that "A-share returns are subject to market specific risk and investor sentiment that is specific to Shanghai (Shenzhen)".

[Girardin and Liu] introduced an interesting Markov-switching model identifying three states (rather than the usual two states): "*speculative, bull and bear market*" [Girardin and Liu]. It is to be noted that the article analyses capital gains rather than stock returns "*In the Chinese context this is a natural step since firms hardly distribute any dividends"* [Girardin and Liu]. One of the main conclusions of this article is that the bullish market performs the function of a buffer and it is hence an intermediate step between crashes and "*too rapid upward movements*". It is also important to remark that this article was written in 2003 and the data

set goes from January 1995 to February 2002, hence missing some very important developments in the Chinese capital market such as the QFII pilot as well as major macro events as the financial crisis in 2008 in the US (China launched a massive domestic stimulus as a response to the US financial crisis).

5.4. Analysis

As previously mentioned the Markov-switching analysis was performed using free source code available for Matlab [Perlin]. The results are interesting showing the differences in behaviors between two main types of companies. Large state-owned banks and the rest of the corporate seem to, according to the results from the Markov-switching analysis, behave in a rather different way (that will be explained in this section). This Markov-switching model tries to differentiate between two states, one that could be identified as a bullish state and another one that could be identified as a bearish state. In the table below the expected duration for each regime (for all the companies) is shown.

Table 33 – Expected duration

Company	Sector (Bloomberg)	H-share short-selling?	Expected duration of regime1	Expected duration of regime 2
Angang Steel	Steel producer	Allowed	157.38	Inf
Anhui Expressway	Infrastructure construction	Allowed	3.82	5.31
Bank of Communications	Banks	Allowed	156.43	Inf
Bank of China	Banks	Allowed	113.54	Inf
Anhui Conch	Cement & Aggregates	Allowed	134.59	44.31
Aluminium of China	Base metals	Allowed	156.8	Inf
Air China	Passenger transportation	Allowed	121.62	17.97
Beijing North Star	Multi Assset Class	Not Allowed	139.24	18.08
China Coal Energy	Coal operations	Allowed	48.85	5.91
China Construction bank	Banks	Allowed	115.74	Inf
China Cosco	Marine transportation services	Allowed	39.08	38.52
China Eastern Airlines	Passenger transportation	Allowed	21.81	11.75
China Life	Life Insurance	Allowed	132.03	49.43
China Merchants	Banks	Allowed	33.2	9.58
China Oilfield	Oil & Gas Services	Allowed	74.41	61.27
China Petroleum	Integrated oil	Allowed	18.58	11.02
China Railway	Infrastructure construction	Allowed	155.66	Inf
China Shenhua	Coal Operations	Allowed	8.38	20.38
China Shipping	Marine transportation services	Allowed	46.49	19.93
CITIC	Institutional Brokerage	Allowed	34.51	13.18
China Southern Airlines	Passenger transportation	Allowed	3.7	3.27
Datang international	Power Generation	Allowed	44.49	24.96
Dongfang International	Power Generation Equipment	Allowed	14.64	12.85
Guangzhou Pharma	Speciality Pharma	Allowed	3.79	86.27
Guangzhou shipyard	Ship/boat building	Not Allowed	13.42	10.69
Huaneng	Power Generation	Allowed	26.05	35.32

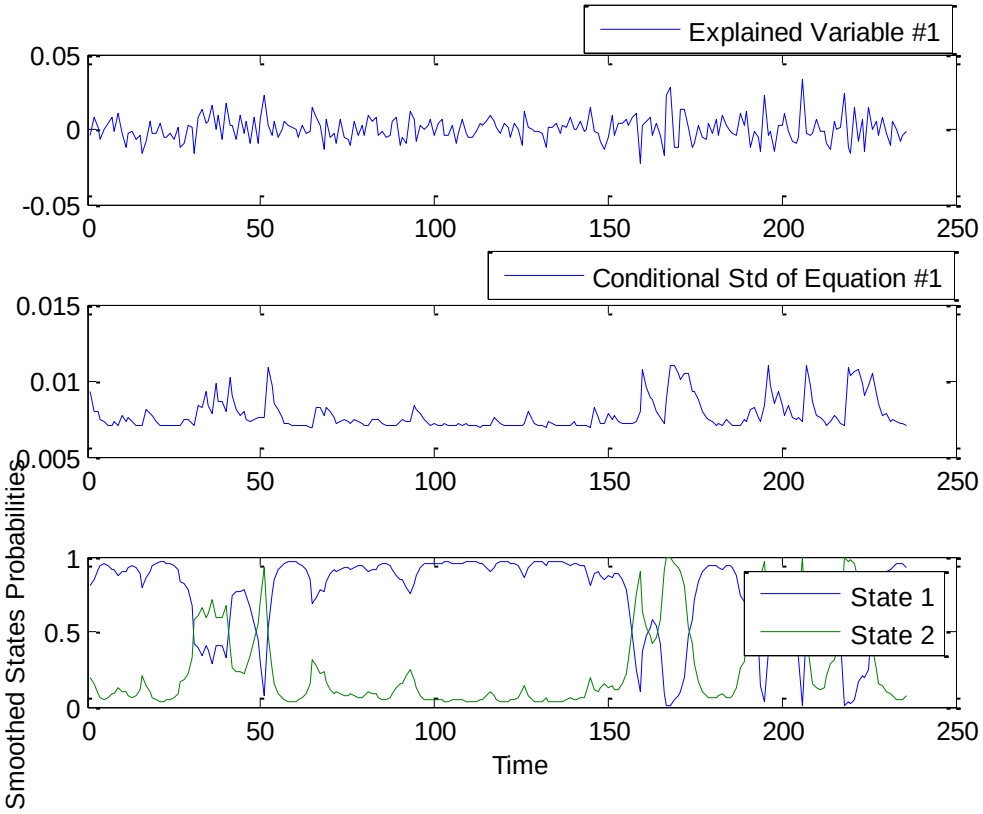
Hisense International	Home improvement	Not Allowed	29.83	6.93
Huadian Power	Power Generation	Allowed	16.64	48.34
ICBC	Banks	Allowed	73.087	79.56
Jiangsu Expressway	Infrastructure construction	Allowed	64.42	33.58
Jiangwei Textile	Industrial Machinery	Allowed	32.84	16.27
Jiangxi Copper	Base metals	Allowed	142.6	27.09
Luoyang Glass	Glass product manufacturing	Not Allowed	38.08	28.24
North East Electric	Power transmission	Not Allowed	25.27	12.87
Petro China	Integrated oil	Allowed	90.75	41.16
Ping An	Life Insurance	Allowed	157.98	Inf
Shangdong Chenming	Paper manufacturing	Not Allowed	4.01	2.51
Shangdong Pharmaceutical	Speciality Pharma	Not Allowed	2.06	1.34
Shenji Group	Metal Working Machinery	Not Allowed	35.5	54.26
Shenzhen Expressway	Infrastructure construction	Allowed	7.45	5.64
Sinopec chemical	Basic & Diversified Chemical	Allowed	4.92	4.88
Sinopec Shanghai	Basic & Diversified Petrochemical	Allowed	26.16	77.05
Tianjin Capital	Utility Networks	Not Allowed	15.79	5.22
Tsingtao	Beverages	Allowed	4.08	5.65
Weichai Power	Commercial vehicles	Allowed	55.95	82.42
Yanzhou mining	Coal operations	Allowed	9.38	9.45
Zijing Mining	Precious metals mining	Allowed	53.17	15.12

5.5. Case Studies

5.5.1 Case Study - Tianjin Capital

Tianjin Capital is an example of a typical dual listed company. Tianjin Capital has 1,370 employees (source: Bloomberg) and its main business line is water recycling and related business. Most of its equity capitalization is in the A-share market, RMB 10,165,585,540 (according to figures from Bloomberg), while RMB 868,118,600 is in the H-share market. Its expected regime durations are 15,79 and 5.22 (many corporate have similar behavior).

Figure 17. Tianjin Capital



Model Output

Switching Parameters (Distribution Parameters)

State 1

Model's Variance: 0.000040

Std Error (p. value): 0.0000 (0.00)

State 2

Model's Variance: 0.000148

Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)

Switching Parameters for Equation #1

State 1

Value: -0.0003

Std Error (p. value): 0.0000 (0.00)

State 2

Value: 0.0020

Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)

0.94 (0.00,0.00) 0.19 (0.00,0.00)

0.06 (0.00,0.00) 0.81 (0.00,0.00)

Expected Duration of Regimes

Expected duration of Regime #1: 15.79 time periods

Expected duration of Regime #2: 5.22 time periods

Results

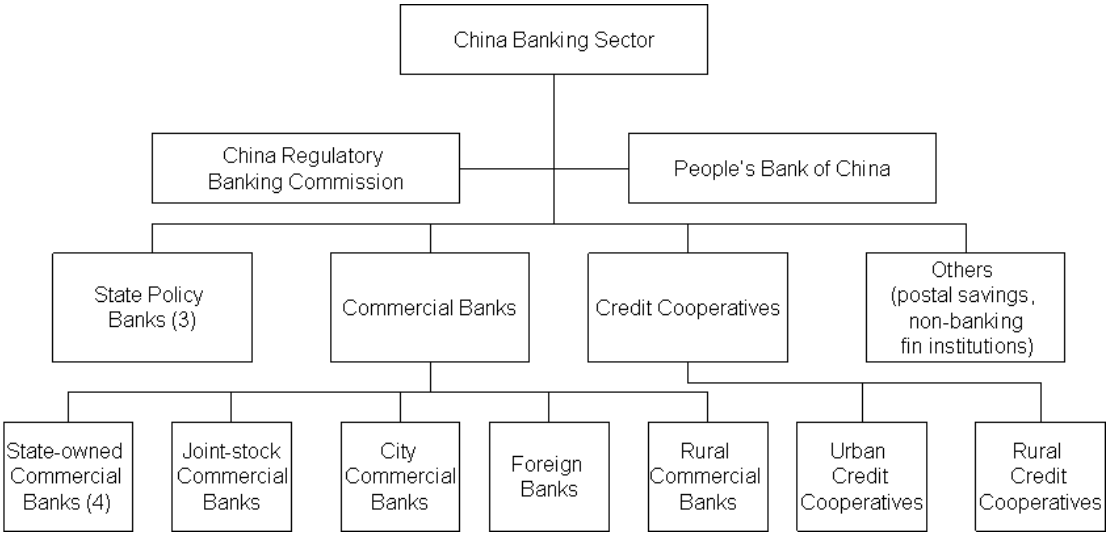
Tianjin Capital was selected for a case study because is a typical case of a corporate (completely different from the behavior of large state-owned banks). The expected durations are typical expected durations (roughly one to three weeks), which is basically in line with what an analysts would expect (from a qualitative point of view).

Tianjin Capital was also selected for a case study because while water recycling is an important sector (in fact it is mentioned in the current 5-year plan as a priority sector) it is arguably not a systemically critical company (like banks, insurance or large oil companies). The company had a typical duration regime (a few days) for a corporate. This is fully consistent with our expectations i.e. Tianjin Capital behaving like an average company rather than a more "stable" large state-owned bank.

5.5.2. Case study - China Construction Bank vs. China Merchants Bank

These two banks belong to two different types of banking institutions. If we follow the classification of the banking system proposed by the accounting house KPMG (which is followed by most other market players) then the banking sector can be divided as follows:

Figure 18: KPMG's banking classification



Source: Directly taken from KPMG report "China's City Commercial Banks: Opportunity knocks?

China Construction Bank clearly belongs to the big four state-owned banks category while China Merchants belongs to the joint-stock commercial bank category. The big four state-owned commercial banks are considered by the Chinese authorities "systemically important" and hence required to hold higher levels of reserves (core capital) than the rest of banks. At the end of 2012, China Banking Regulatory Commission announced new capital ratios to be maintained by banks by the end of 2013:

Ratio (min)	Systemically important (%)	Not systemically important (%)
Capital Adequacy Ratio	9.5	8.5
Tier 1 Capital Adequacy Ratio	7.5	6.5
Core Tier 1 Capital Adequacy Ratio	6.5	5.5

Source: CBRC

From a qualitative point of view it is reasonable that the big four state-owned Chinese banks have a different behavior, variance (risk) wise, than other Chinese banks. It is considered by many market participants that these banks are too big to fail and that they would be rescued in the case of running into trouble. The main purpose of these state-owned banks is, arguably, not shareholding value maximization. These institutions have other goals such an ensuring economic stability (ensuring that large state owned companies do not run into funding issues) as well as supporting strategic industries (regardless of profitability). This situation seems consistent with a more stable trading pattern i.e., switching Markov model with infinite life

period in one state. While some analysts have questioned the strength of the balance sheet of these banks, very few have questioned the ability (at least currently) and willingness of the Chinese government to support them, making a default of these institutions unlikely.

Furthermore, the higher capital requirements make these banks less likely to run into trouble that the rest of the banks (regardless of a theoretical bailout by the government). In fact credit rating agencies such as S&P, Moody's or Fitch consider capital ratios as a major factor when analyzing the financial positions of banks (and hence the likelihood of a default).

It is to be noted that on a global basis there are only 28 banks considered systemically important. Only one bank from the developing world, Bank of China, is included in this global list generated by the Financial Stability Board [FSB Report]. From a domestic, China, point of view the four big state-owned banks are considered systemically important.

Difference in size

The first thing to mention when comparing these two institutions is the difference in size. There is a colossal difference in size between the two institutions. The big-four state-owned banks represent the bulk of the banking operations of the country.

	China Construction Bank	China Merchants Bank
Market Cap (Q3 2012)	1,086,676	48,103
Revenue (FY 2011 CNY million)		
China	395,837	5,255
Rest of the world	3,566	-
Employees	335,019	7,938

Source: Bloomberg

Nevertheless, China Merchants is a successful bank in China. There is a famous case study from Harvard Business School [McFarlan] analyzing the innovations introduced in the Chinese market by China Merchants Bank. Anecdotic evidence seems to indicate that China Merchants Bank is considered as one of the best Chinese bank by the Chinese population.

Table 34: Global – Systemically important banks

Global - Systemically important banks (Financial Stability Board)	
Citigroup	Bank of China
Deutsche Bank	BBVA
HSBC	Groupe BPCE
JP Morgan Chase	Group Crédit Agricole
Barclays	ING Bank
BNP Paribas	Mizuho FG
Bank of America	Nordea
Bank of New York Mellon	Santander
Credit Suisse	Société Générale
Goldman Sachs	Standard Chartered
Mitsubishi UFJ FG	State Street
Morgan Stanley	Sumitomo Mitsui FG
Royal Bank of Scotland	Unicredit Group
UBS	Wells Fargo

Source: Financial Stability Board

Brief introduction to China Construction Bank

China Construction Bank is one of the big four state-owned banks. Its origins date back to 1954 when the then called People's Construction Bank was created. At this stage the People's Construction Bank was fully state-owned and under the supervision of the Ministry of Finance. In 1996 the bank changed its name to China Construction Bank, commonly known as CCB. In 2004 the bank took its current legal form "joint-stock commercial bank". The bank, as previously mentioned is dual listed, the listing in Hong Kong (H-share) happened in October 2005 while the mainland listing happened in September 2007. This bank is considered by most a too big to fail institution. The bank is colossally large with more than 13,581 outlets (2011 financial results) and 45,645 ATMs. The company has approximately 330,000 employees.

Financial Highlights of China Construction Bank		
Amounts (RMB mil)	2010	2011
Operating Income	325,780	399,403
Profit Before Tax	175,156	219,107
Net Profit	135,031	169,439
Total Assets	10,810,317	12,281,834
Total Liabilities	10,109,412	11,465,173
Total Equity Attributable to Shareholders	696,792	811,141

Paid in Capital	250,011	250,011
Core Capital Adequacy Ratio (%)	10.40	10.97
Capital Adequacy Ratio (%)	12.68	13.68
Non-performing Loan Ratio (%)	1.14	1.09

Source: Annual reports, Bloomberg

CCB remains one of the core financial institutions in China and it is controlled by the state. Its revenue is mostly domestic (99.1% in 2011) but it is developing its overseas operations rapidly. Their top five shareholders are:

Company	Share (%)
Ping An Life Insurance	16.96
Baosteel Group	3.32
Central Hujin Investment	3.12
China Life insurance Group	2.13
CSOP Asset Management	0.67

Source: Bloomberg (Jan 2012)

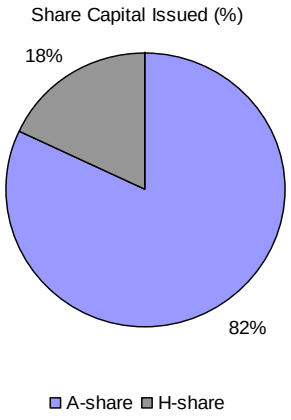
The company has relatively high credit rating (by the main rating providers).

Rating Agency	Long-term	Short-term	Outlook
S&P	A	A-1	Stable
Moody	A1	P-1	Stable
Fitch	A	F1	Stable

Source: CCB, as of Jan 2012.

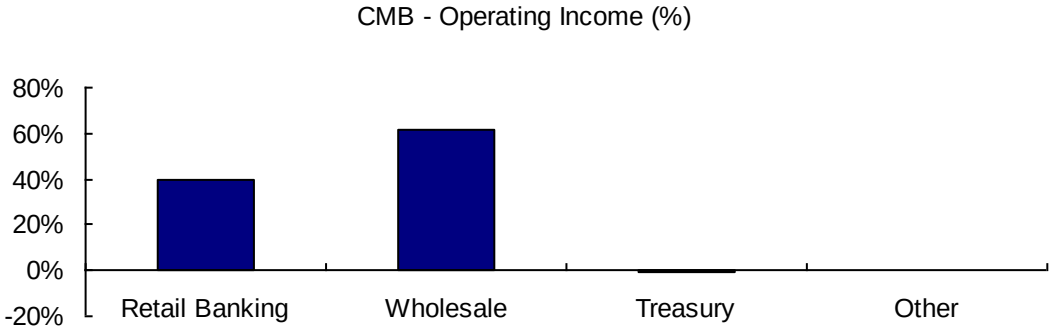
Brief introduction to China Merchants Bank

China Merchants bank was formed in 1987. It is classified [KPMG] as a joint-stock bank. According to official statements from the company, China Merchants Bank has 94 branches, 813 sub-branches and more than 50,000 employees. The bulk of the capitalization is in the A-share market.



Source: CMB – fact sheet (as of June 2012)

The bank focuses on the mainland China market with very small operations overseas (with only one branch and representative office in New York and another representative office in London [Source: Bank company website]). China Merchants Bank is one of the main issuers of credit cards in China (63.4 million credit cards as of June 2012) and has [McFarlan] a high quality IT/operations system.



Source: CMB – fact sheet (as of June 2012)

Rating Agency	Long-term	Short-term	Outlook
S&P	BBB+	A-2	Stable
Moody	Baa3	P-3	Stable
Fitch	BBB	-	Stable

Source: Bloomberg, end of 2012.

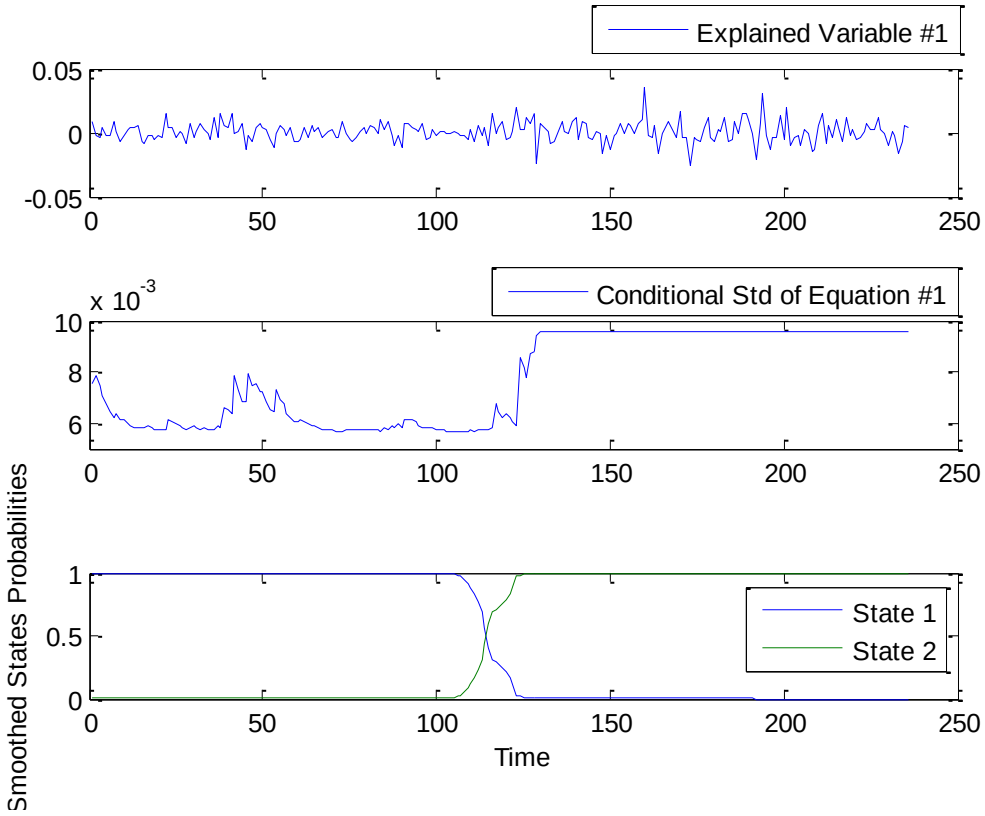
Markov-switching Model results for CCB and China Merchants Bank

The results for China Construction Bank (one of the large big four state-owned banks) and China Merchants are a typical example of the differences between the behavior of the large state-owned banks and the rest of banks. It can be seen for the results below that the expected duration of one of the regimes for China Construction Bank is infinite (the same result is obtained for the other large state-owned banks) while the duration for the regimes in the case of China Merchants Banks are 33.2 and 9.58 time periods respectively, which is in line with non-state-owned banks and the rest of corporations.

China Construction Bank

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000031
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000091
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0002
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0008
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.00 (0.00,0.00)
0.01 (0.00,0.00) 1.00 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 115.74 time periods
Expected duration of Regime #2: Inf time periods

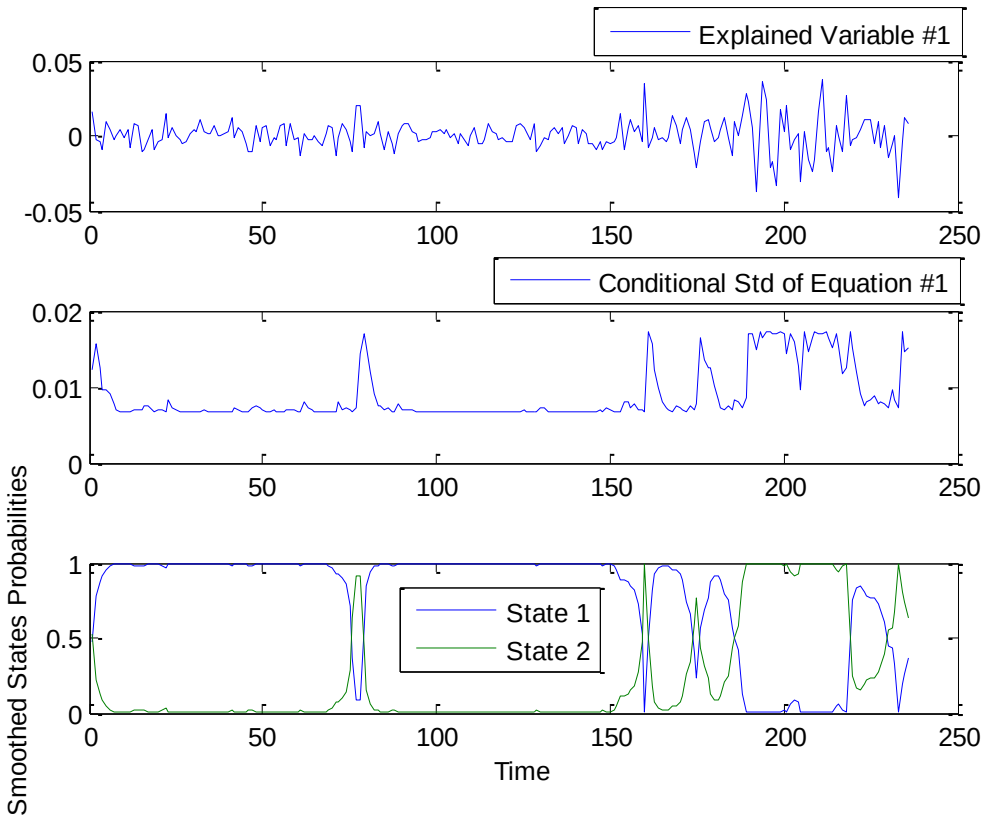


China Merchants

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000038
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000338
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1

State 1
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.10 (0.00,0.00)
0.03 (0.00,0.00) 0.90 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 33.20 time periods
Expected duration of Regime #2: 9.58 time periods



Conclusions

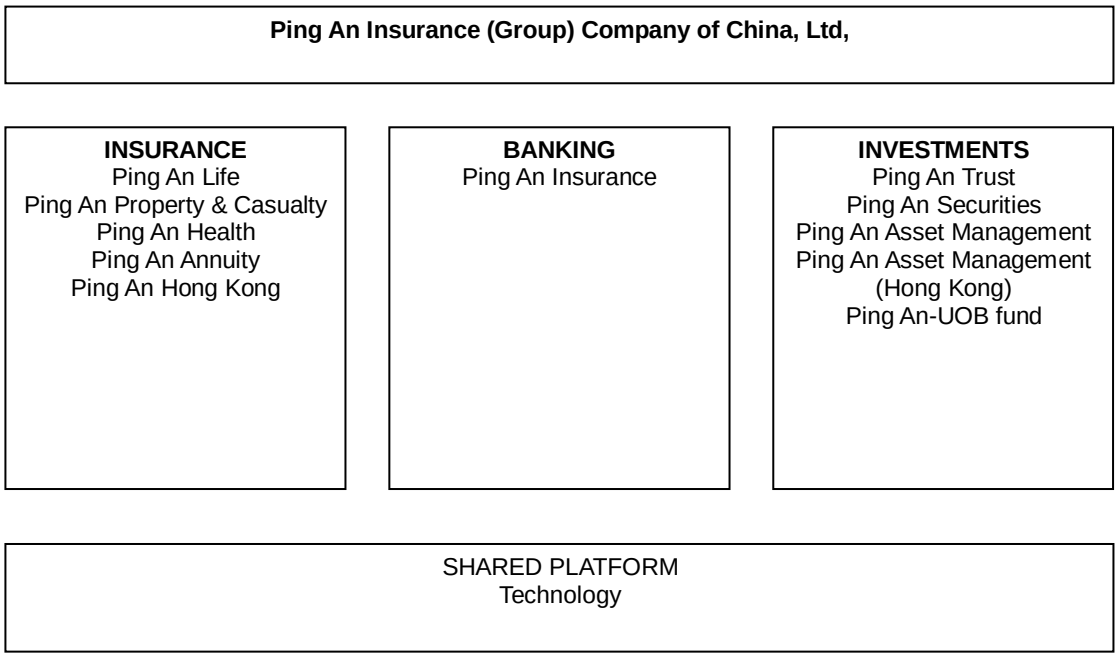
The results from the Markov-switching model seems to indicate that the big four banks tend to behave in a rather different way to the rest of banks (and other corporations). It seems that the big four state-owned banks have one of the regimes of the Markov-switching model with an infinite expected duration. Qualitatively this result seems reasonable as these banks have a very different shareholder structure (government is a buy and hold investor), their main objective is not simply shareholder profit maximization and (according to some market participants) are more reticent to introduce changes to their operations and products than banks such as China Merchants or China Minsheng Bank.

5.5.3. Case study: Ping An

Brief company introduction

Ping An is an interesting company that has evolved from a insurance player to a more diversified financial service provider. The company has three major business lines: insurance, banking and investments. The company structure is relatively simple. According to Ping An's 2011 annual report the company has more than 70 million customers across China as well as 175,136 employees and 486,911 sales agents. While not comparable with the large state–owned banks, Ping An is a sizeable player in the landscape of the Chinese financial market.

Figure 19 – Ping An (Taken from Ping An Website)



Source: Ping An website

According to the same source (20011 corporate presentation) the company has 35 branches in China and in excess of "2,400 business outlets". The company follows a typical distribution of outlets across China with the bulk concentrated in the Eastern coast area.

Shareholders

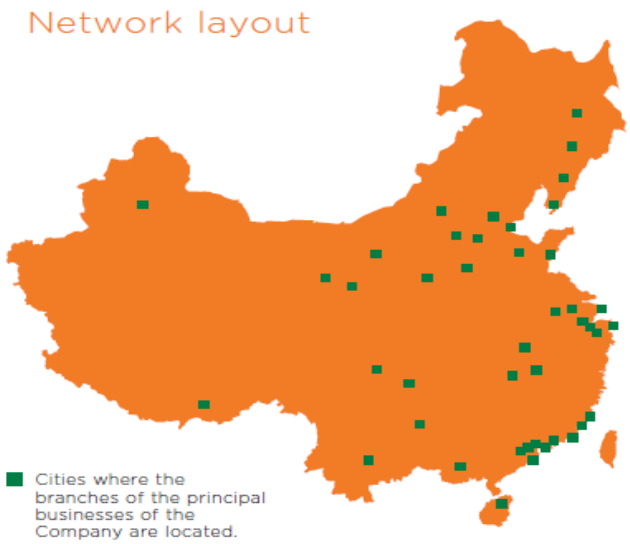
Until very recently HSBC was a major strategic investor in Ping An. HSBC sold its stake to a Thai based company with links to the mainland (Charoen Pokphand).

Ping An Major shareholders	
A-share	**Percentage**
Shenzhen Investment	10.06%
Yuan Trust Investment	7.94%
Linzhi Xinhao Shi	6.67%
LZ Jing'ao	5.72%
China Foreign Econ	5.05%
Shun Yip Holdings	3.75%
Shenzhen Wuxin Yufu	3.74%
H-share	**Percentage**
Charoen Pokphand	39.39%
JP Morgan	8.97%
Diamond Epoch	8.20%
Blackrock	6.95%
Vanguard	3.09%
Jinjun Co	2.43%
FMR	1.61%

Source: Bloomberg

Branch network

Figure 20- Ping An branch distribution in China



Source: Taken directly from Ping An 2001 Corporate Results presentation

Ping An is a major shareholder of China Construction Bank with an equity stake of 16.96% (January 2012). This is an important fact as it seems to follow, as it will be discussed later, a behavior similar to the big state-owned banks.

CNY Million	**2010**	**2011**
Total Income	195,814	272,244
Net Profit	17,938	22,582
Total Assets	1,171,627	2,285,424
Total Equity	116,883	171,342
EPS	2.3	2.5

Source: Ping An website, Bloomberg

Credit ratings

The company is rated by domestic credit rating agencies (Chengxin International Credit Rating and Dandong Credit Rating).

Ping An Ratings	
Chengxin International Credit Rating	AAA
Dagong Credit Rating	AAA

Source: Ping An website

While predominantly an insurance company Ping An has done a significant push into the banking segment. In fact, Ping An is consolidating its banking operations. Ping An Insurance Group owns 52% of Shenzhen Development Bank and it is also the parent company of Ping An Bank. Recently, the operations of Shenzhen Development Bank and Ping An Bank were merged and they operate now (all) under the commercial name Ping An Bank. Ping An Bank currently has 404 outlets (source: 2012 Ping An Bank reports)

Table 35 – Ping An Bank financial

Ping An Bank	
In RMB Millions	
Total Assets	1,490,623
Total Loan	682,906
Total Deposits	949,578
NPL ratio	0.73%

Source: Directly taken from 2012 Ping An Bank Annual report

Ping An has a much more prominent stake (proportionally) in the large four state-owned banks than any other insurance company, which is consistent with the results from the Markov-switching model, i.e. it seems reasonable that a company in the same sector

(financial) but different sub-sector (insurance) with a very large stake in state-owned banks behaves, to a certain degree as those state-owned banks. Ping An not only has a large stake in China Construction Bank (16.96%) but also in Agricultural Bank of China (1.36%) and ICBC (1.07%).

China Construction Bank Major shareholders	
A-share	**Percentage**
Ping An life Insurance	16.96%
Baosteel Group	3.32%
China Investment Corp	3.12%
China Life Insurance	2.13%
CSOP Asset Management	0.75%
Harvest Fund	0.61%
China Asset Management	0.40%
H-share	**Percentage**
China Investment Corp	59.31%
Temasek	7.44%
Bank of America	2.47%
Vanguard	1.57%
Baosteel Group	1.34%
China Investment Corp	1.15%
Blacrock	1.10%

ICBC Major shareholders	
A-share	**Percentage**
China Investment Corp	47.17%
China Ministry of Fiannce	46.92%
Ping An Life Insurance	1.07%
ICBC Credit Suisse	0.40%
China Life Insurance	0.38%
Anbang Asset insurance	0.20%
Sino Life Insurance	0.15%
H-share	**Percentage**
Social Security fund	11.99%
Blacrock	8.13%
JP Morgan	6.85%
Capital Group Company	6.39%
Temasek	5.27%
Vanguard group	3.99%
Goldman Sachs	3.43%

ABC Major shareholders	
A-share	**Percentage**
China Investment Corporation	44.35%
China Ministry of Finance	43.31%
Social Security Fund	3.78%
Ping An Life Insurance	1.36%
China Life Insurance Group	0.46%
Fortune Trust	0.38%
China Asset Management	0.11%
H-share	**Percentage**
Capital Group	23.62%
Qatar holdings	22.18%
Blackrock	10.27%
citigroup	7.64%
JP Morgan	4.94%
Destche Bank	3.75%
Vanguard	3.66%

BOC Major shareholders	
A-share	**Percentage**
China Investment Corporation	96.58%
China Life insurance	0.31%
PICC Property & Casualty	0.10%
Sino Life Insurance	0.06%
Shenhua Group	0.05%
Aluminium Corp of China	0.05%
China Southern Power	0.05%
H-share	**Percentage**
Blackrock	10.06%
Social Securityfund	8. 99%
Capital Group Company	7.43%
JP Morgan	4.89%
Vanguard	4.62%
Temasek	3.73%
Dimensional Fund	1.27%

Data source: Bloomberg

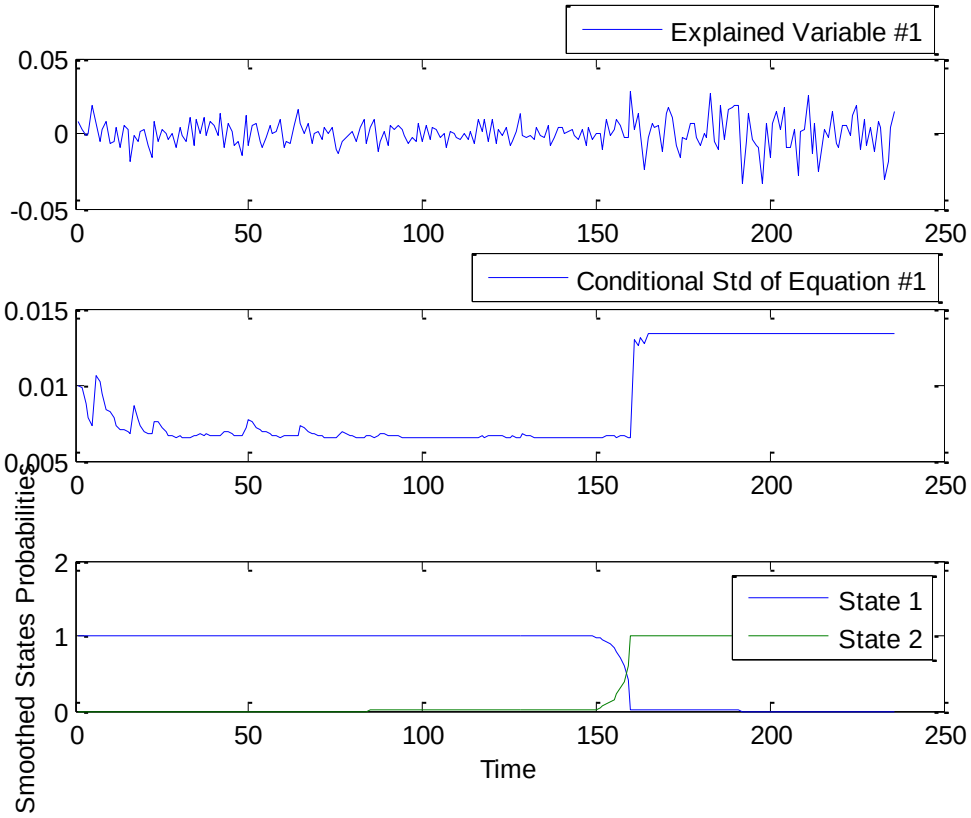
Analysis

In the same way than the big four state-owned banks, one of the regimes (Markov-switching) for the case of Ping An has an infinite expected duration. While other insurance companies have long expected duration Ping An is the only one, among those companies, that have an infinite one. It is important to note that Ping An is one of the major shareholder of China

Construction Bank (nearly 17% of A-share market cap). Some other insurance companies like China Life are also investors in China Construction Bank (and the other large state-owned banks) but the ownership percentage is considerably bigger in the case of Ping An.

Ping An

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000041
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000180
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #
State 1
Value: -0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.00 (0.00,0.00)
0.01 (0.00,0.00) 1.00 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 157.98 time periods
Expected duration of Regime #2: Inf time periods



Conclusion

Ping An behavior is similar to the big four banks. In general, insurance companies tend to have a significantly larger expected duration regime than other corporations but Ping An results are extreme among insurance companies having a infinite regime expected duration. This might be, as previously mentioned, related to its large investments in the state-owned banks (larger than peers).

5.5.4. Case study - China Life

After finding indications that the big four–state owned banks and Ping An Insurance behaves, according to a Markov-switching model in a different way than the rest of the market the next obvious question is thinking about the other insurance companies. For instance, in this case study China Life is analyzed.

China Life brief company introduction

China Life insurance is a traditional insurance company with approximately 100,000 employees (according to its 2011 annual report). The company not only listed in Hong Kong and in the mainland but also in the US (ADRs).

Table 36 - Shareholders

China Life Major shareholders	
A-share	**Percentage**
China Life insurance	92.80%
Boshi Group	0.24%
Chansheng Group	0.23%
Dacheng Group	0.15%
China Asset Management	0.14%
Invesco Great Wall	0.11%
Huan Fund Management	0.08%
H-share	**Percentage**
Blackrock	10.50%
Vanguard	5.11%
Carmignac gestion	1.76%
Hang Seng investment	0.85%
FMR	0.85%
State Street Global	0.83%
Deustche Bank	0.68%

Source: Bloomberg

Table 37 - Financials

China Life - key financials	
RMB million	
Total Assets	1,577,125
Total Liabilities	1,390,219
Total Revenues	370,899
EPS	0.65

Source: Directly taken from 2011 annual report

Table 38 - Insurance premiums in 2011

Chine Life insurance premiums 2011	
RMB millions	
Individual Life Insurance Business	302,012
First-year Business	147,286
Single	99,190
First-year Regular	48,096
Renewal Business	154,726
Group Life Insurance Business	438
First-year Business	435
Single	427
First-year Regular	8
Renewal Business	3

Short-term Insurance Business	15,802
Short-term Accident Business	8,766
Short-term Health Insurance Business	7,036

Source: Directly taken from 2011 annual report

Markov- Switching Model for China Life

The results from the Markov-switching model indicate that China Life has expected duration regimes of 132 and 49 time periods. These expected durations are longer than for most other insurance companies but finite. This is consistent with insurance companies being more "stable" than other corporate while not reaching the behavior of the large state-owned banks.

China Life

Non Switching Parameters

Switching Parameters (Distribution Parameters)

State 1

Model's Variance: 0.000035

Std Error (p. value): 0.0000 (0.00)

State 2

Model's Variance: 0.000180

Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)

Switching Parameters for Equation #1 - Indep column 1

State 1

Value: 0.0003

Std Error (p. value): 0.0000 (0.00)

State 2

Value: 0.0011

Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value) <---

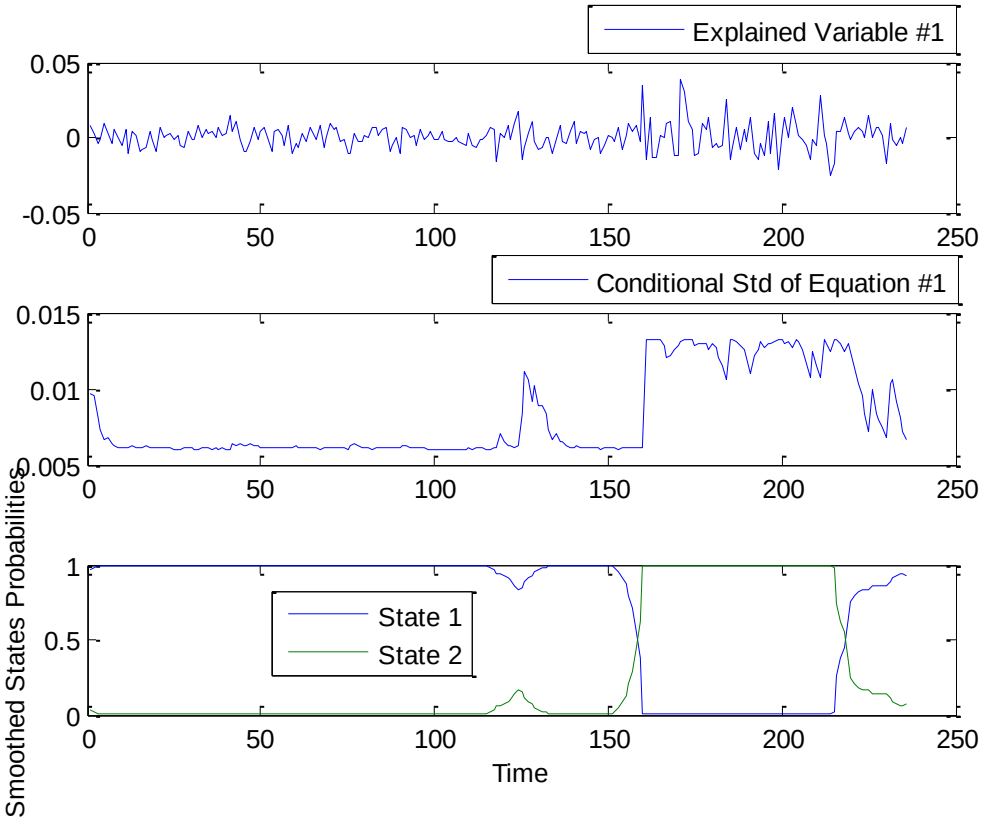
0.99 (0.00,0.00) 0.02 (0.00,0.00)

0.01 (0.00,0.00) 0.98 (0.00,0.00)

Expected Duration of Regimes <---

Expected duration of Regime #1: 132.03 time periods

Expected duration of Regime #2: 49.43 time periods



Conclusion

China Life insurance seems to fit the model of a classical insurance company (Markov-switching analysis) having long regime expected durations (longer than an average corporate) but finite (opposite to the large state-owned banks). China Life insurance has smaller percentage of ownership in state-owned banks than Ping An. This could be part of the explanation of the different behavior between these two companies.

5.5.5. Case Study - Aluminum Corp of China (Chalco)

Aluminum Corp of China (Chalco) is a special case. From a Markov-switching point of view, it has a behavior in line with the big four state-owned banks but it does not fit in the category of financial institutions. Commodity related companies such as oil companies and aluminum seem to present a mixed behavior when analyzed through a Markov-switching approach. These companies, in general, share with the big four state-owned banks that they are large, strategically important, government owned or controlled companies.

Company introduction

Chalco is a dominant player in its sector. The company is listed in the mainland (A-share),

Hong Kong (H-shares) and US (ADRs). It is clearly related to the property and infrastructure sector. In recent year it has come under pressure as the authorities are trying to control the development of a real estate bubble introducing several rounds of tightening policies in the property sector. Property developers and related companies (such as aluminum producers) suffered as a consequence of such policies. Chalco is a vertically integrated producer and benefits from large economies of scale.

Table 39 - Shareholders

Chalco Major shareholders	
A-share	**Percentage**
Aluminum Corp of China	54.43%
China Cinda Asset Management	8.36%
China Construction Bank	6.89%
Yinhua fund management	0.41%
China Asset Management	0.39%
E Fund Management	0.20%
Harvest Fund	0.20%
H-share	**Percentage**
Franklin	46.17%
Blackrock	5.32%
Vanguard	5.23%
JP Morgan	3.61%
Templeton	2.61%
Deustche Bank	1.30%

Source: Bloomberg

Markov- switching Model for Aluminum of China

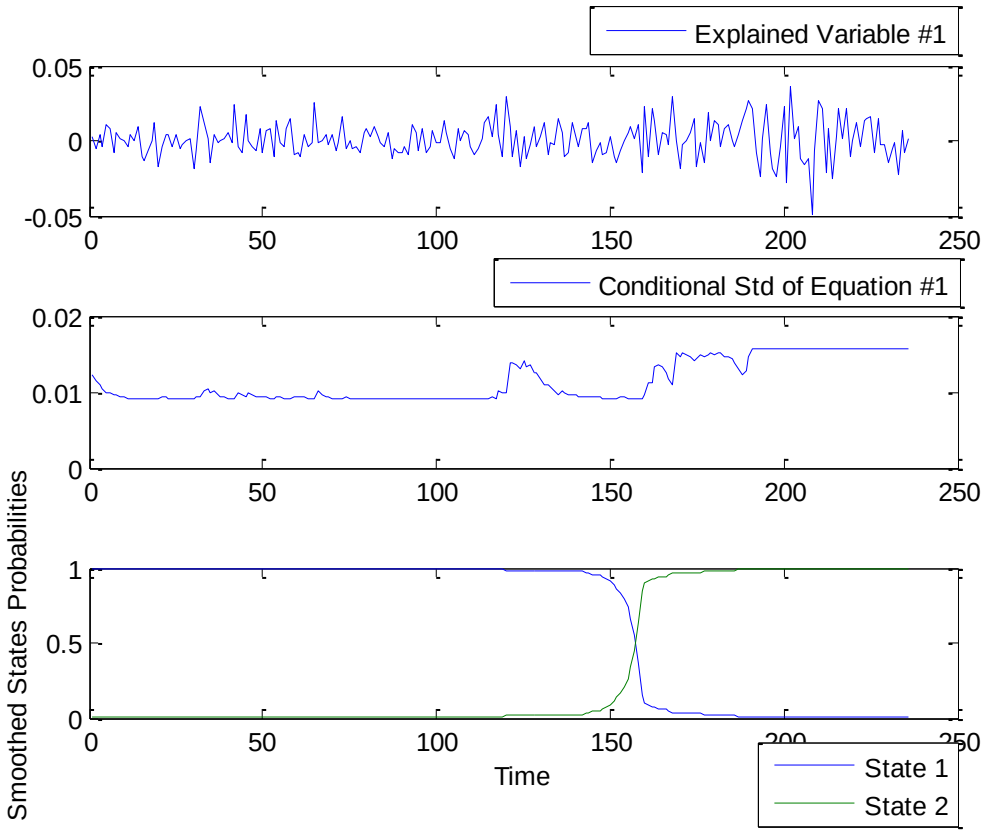
Chalco has almost infinite expected regime duration. Markov-switching analysis seem to create two distinct type of companies, one formed by the big four banks (including related companies such as Ping An) and the other one formed by the rest of companies. Chalco seems to be the only company (of the ones analyzed) that has a nearly infinite expected regime while not being one of the large state-owned banks or related companies.

Aluminum of China

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000080
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000245
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0005
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0013
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value) <---
0.99 (0.00,0.00) 0.00 (0.00,0.00)
0.01 (0.00,0.00) 1.00 (0.00,0.00)
Expected Duration of Regimes <---
Expected duration of Regime #1: 156.80 time periods
Expected duration of Regime #2: 2856707660875.67 time periods



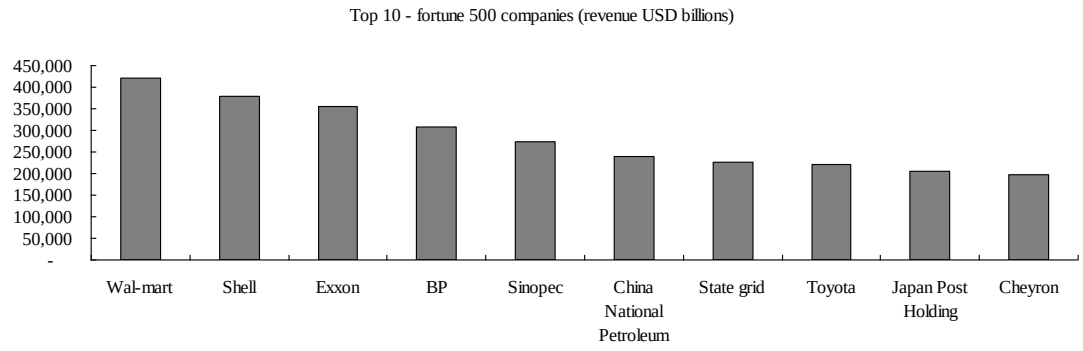
Conclusions

Chalco has an atypical behavior with a nearly infinite expected duration. Chalco does share some characteristics with the large state-owned banks such as being government controlled but this point is shared with other companies such as for instance the big oil Chinese corporations that seem to have a typical corporate behavior i.e. normal (finite) expected regime durations.

5.5.6. Case Study: Oil sector

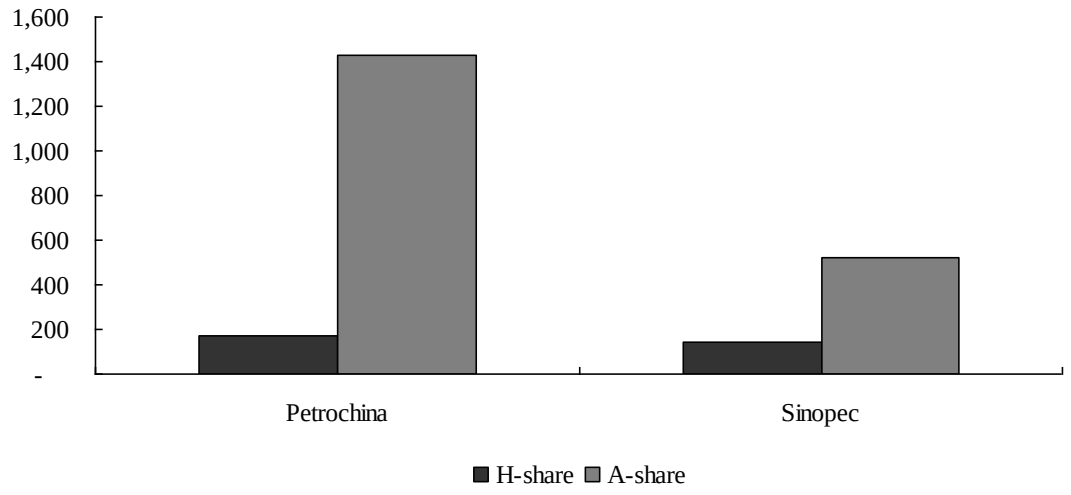
The oil sector in China is dominated by three large state-owned players PetroChina and Sinopec and CNOOC. This analysis focuses on PetroChina and Sinopec. Those two companies are considerably large institutions employing (according to Bloomberg) 548,355 and 376,201 people respectively. PetroChina and Sinopec are comparable companies. PetroChina has a bigger overall market capitalization (almost double in the A-share market). Despite its importance to the overall economy and size (which will be explains in the following section). These two companies seem to behave (according to the Markov-switching model) basically in the same way than normal corporate (as opposite to state-owned banks and related companies). Sinopec and PetroChina are among the top 10 Global Fortune 500 companies.

Figure 21 – Top 10 Global Fortune 500 companies



Source: Fortune magazine

Figure 22- Market cap (oil companies)

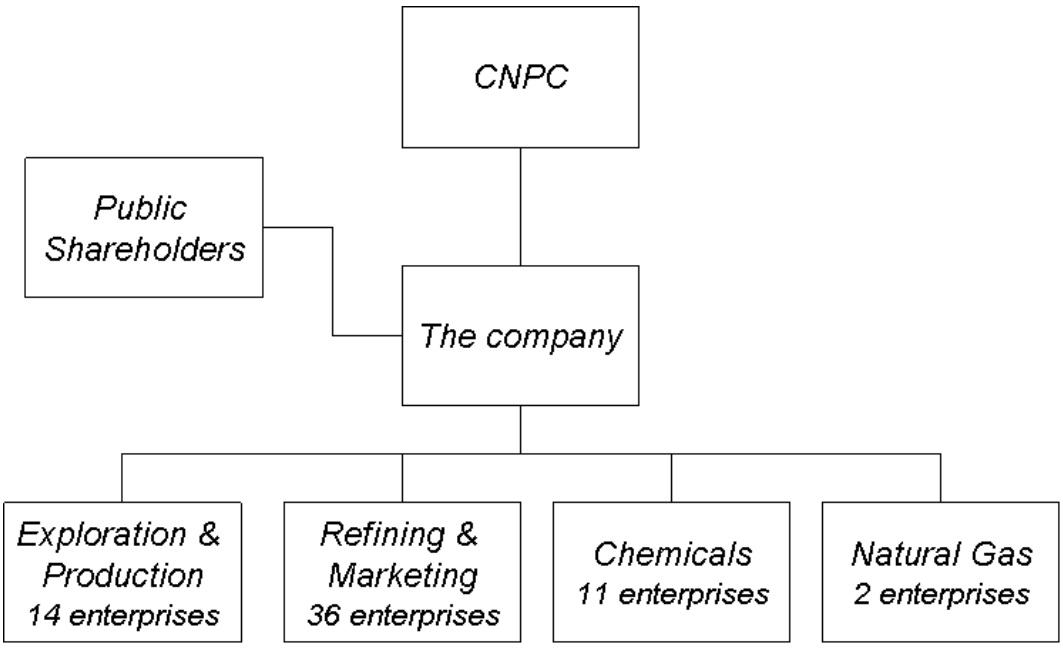


Source: Data from Bloomberg

Brief company introduction – PetroChina

PetroChina is the largest producer of oil (as well as natural gas) in mainland China. PetroChina listed in Hong Kong in 2000. PetroChina has been in operation since the creation of the PRC (Peoples Republic of China) with the first exploration activities (listed in the company prospectus) dating back to 1950.

Figure 23 - PetroChina corporate structure (according to 2000 Hong Kong IPO)



Source: Taken directly from 200 company IPO prospectus

PetroChina Shareholder structure

China National Petroleum is currently the main shareholder of PetroChina owning 97.5% of its A-share market cap. Franklin Resources is the largest foreign investor accounting for 11.8% of its H-share market cap (according to data from Bloomberg)

PetroChina shareholders	
A-share	**Percentage**
China National Petroleum	97.50%
Social Security Fund	0.25%
China Life Insurance	0.08%
Lion Fund Management	0.05%
China Asset Management	0.03%
China Universal Asset Management	0.03%
Guanxi Investment	0.02%
H-share	**Percentage**
Franklin Resources	11.88%
Blacrock	9.49%
Aberdeen	8.15%
JP Morgan	6.99%
Vanguard	5.10%
Harbor Capital	1.66%

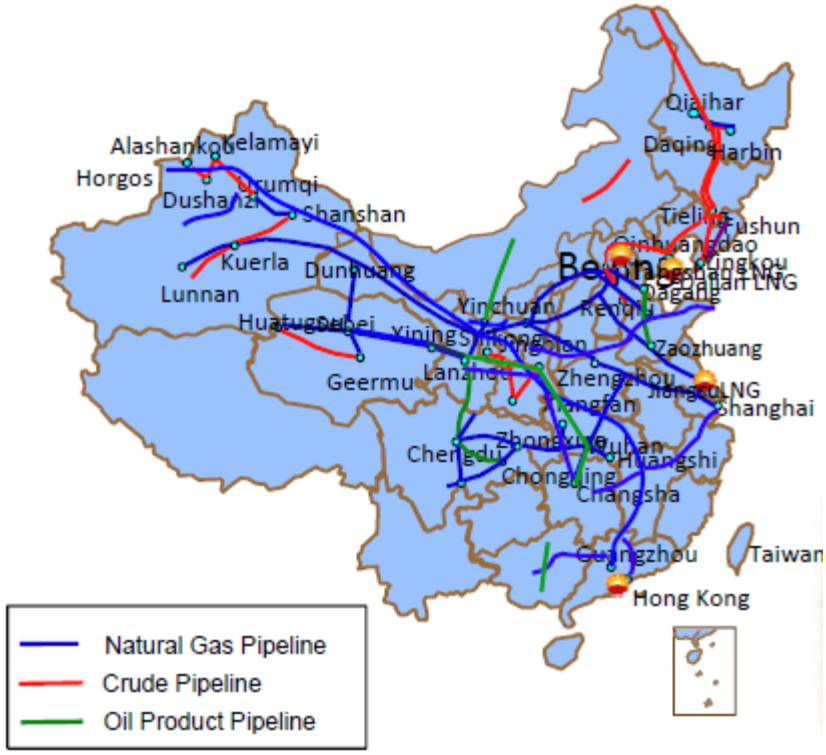
Source: Bloomberg

The company has considerable exploration activities:

Source: taken from IPO prospectus

The company also owns the largest pipeline network in mainland China. In the figure below (taken from the 2012 annual results presentation) it can be appreciated that PetroChina pipelines link the inner provinces (rich in resources) to the coastal areas in the east (heavily industrialized).

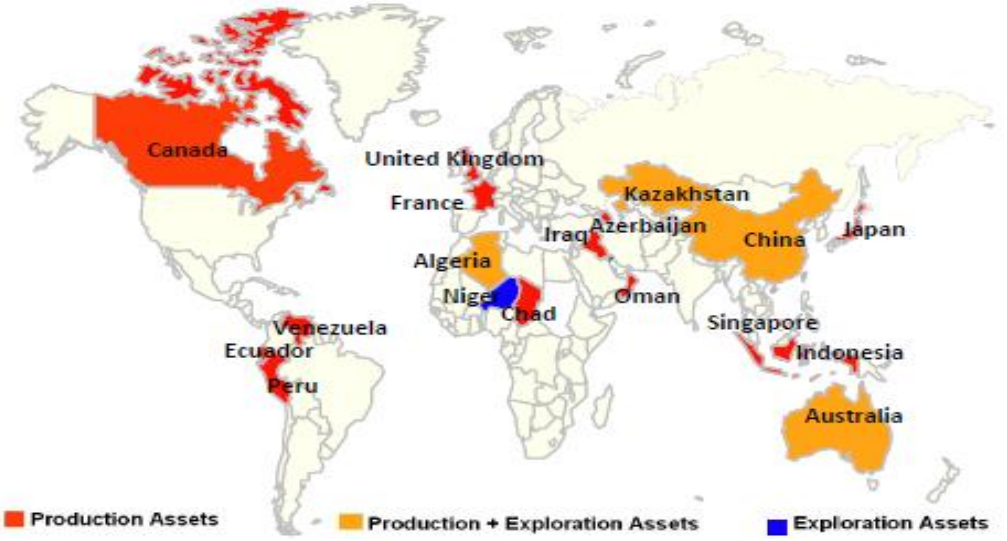
Figure 24 – PetroChina pipelines



Source: Taken from 2012 PetroChina results

PetroChina is also very active internationally with operations in Canada, Venezuela, Ecuador, Peru, UK, France, Algeria, Niger, Chad, Iraq, Azerbaijan, Kazakhstan, Oman Japan, Singapore, Indonesia and Australia.

Figure 25 – PetroChina international operations



Source: Taken from 2012 PetroChina results

The bulk of the revenue comes from "marketing" that includes PetroChina gas stations across China as well as its trading business.

PetroChina 2011 revenue breakdown		
Exploration	162,356	8.1%
Refining and chemicals	188,686	9.4%
Marketing	1,494,171	74.6%
Natural gas and pipeline	156,696	7.8%
Head office	1,934	0.1%

Source: Taken from 2011 Annual results

Brief company introduction – Sinopec

While slightly smaller SINOPEC is also an important player in the oil sector in China

Sinopec Shareholder structure

SINOPEC shareholders	
A-share	**Percentage**
China Petrochemical Corp	93.94%
Guotai Junan Securities	0.36%
China Life Insurance Group	0.16%
China Asset Management	0.12%
Harvest Fund Management	0.11%
China Southern Fund	0.10%
Huaan Fund Management	0.10%
H-share	**Percentage**
Blackrock	11.38%
Franklin Resource	10.01%
JP Morgan	9.09%
Government of Singapore	4.05%
Citigroup	3.83%
Credit Suisse	2.66%
Vanguard	2.28%

Source: Bloomberg

Markov-switching for China Petroleum and Sinopec

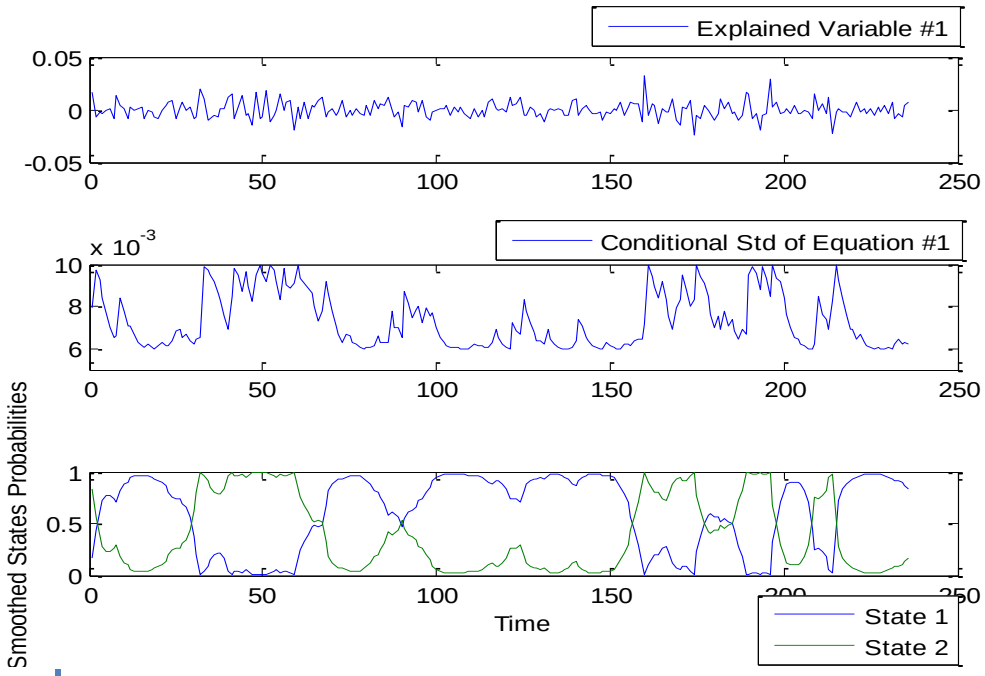
While these two companies are clearly controlled by the government (same way than state-owned banks) and they are also clearly strategically important, they seem to behave in the same way than "normal" corporations i.e. finite expected duration periods. This would seem to indicate that not all the state-owned, strategically important companies behave like the four big banks.

China Petroleum

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000029
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000109
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0007
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.95 (0.00,0.00) 0.09 (0.00,0.00)
0.05 (0.00,0.00) 0.91 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 18.58 time periods
Expected duration of Regime #2: 11.02 time periods

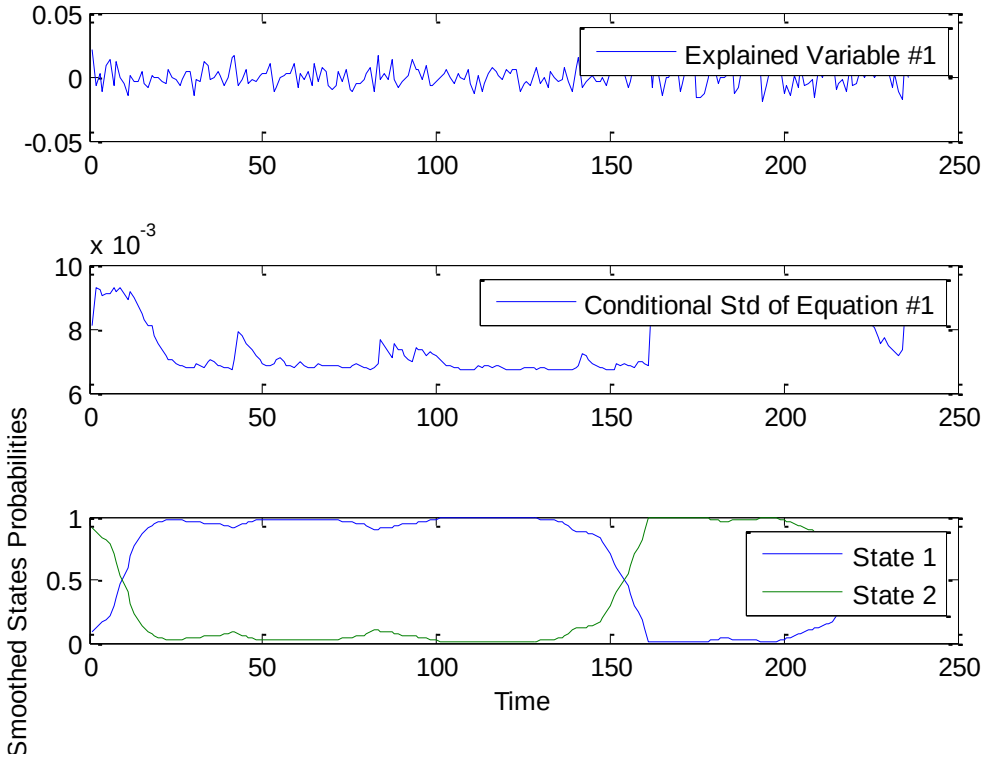
Conclusions

According to the results from the Markov-switching model oil companies, than share some qualitative characteristics with the big four banks, behave more than a typical corporate than a big four bank. Indicating that there seems to be substantial differences between the behavior of large state-owned companies.



Petro China

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000043
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000091
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0006
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.02 (0.00,0.00)
0.01 (0.00,0.00) 0.98 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 90.75 time periods
Expected duration of Regime #2: 41.16 time periods



5.6. Chapter Conclusions

A Markov-switching model is an effective tool to differentiate between different types of companies. A two state Markov-switching model (conceptually differentiating between a bull and a bear market) was used for the modeling. The results clear divided companies into two groups: 1) the large state-owned banks and 2) the rest of companies. Several case studies were presented in this chapter. For instance, Tianjin Capital, which is a typical Chinese corporate operating in the water recycling sector, was analyzed. The company had, as expected, a switching period of just a few days. The results for the large state-owned banks were rather different with all of them showing infinite (or almost infinite) expected duration indicating that such type of financial institution behaves in a more "stable" way than the average corporate. It should be also noted that midsize banks do not, according to the analysis performed, fit in the same category than the large state-owned banks. The recent liquidity squeeze in China was another indication that these two types of institutions behave in different ways. When liquidity in the interbank market decreases the share price of small and midsize banks (much more reliant on interbank funding) was considerable more volatile that the share price of the large state-owned banks (this is fully consistent with the results of our analysis).

Ping An Insurance, a large Chinese insurance group, was also analyzed. Its expected regime duration periods are almost infinite (similarly to the large state-owned banks). Ping An is an interesting case because while it is not one of those banks it does have a massive equity stake in China Construction Bank (16.96%) and it is arguably considered too large to fail. China Life Insurance (a comparable insurance company), while having also relatively long expected duration times, it does not have the same behavior than Ping An i.e., it is not as close to the behavior of a large state-owned bank as Ping An is. The oil sector was also analyzed. It is interesting comparing oil companies with the banking sector because the share a few features such as size and systemic importance. Nevertheless, the results show that the Chinese oil companies behave more like normal corporates than like the large state-owned banks. One reason for this could be related to the fact that Chinese oil companies are, obviously, exposed to the fluctuations of oil prices (international market) while the banking sector, is to some degree, more insulated from the international markets.

Chapter 6. Volatility - GARCH Analysis

6.1. Introduction

In the previous chapters the main quantitative characteristics of dual listed companies were analyzed finding for instance that that while the Hong Kong market (for dual listed Chinese companies) tend to be less volatile than the mainland market, this assumption is not always true for reasonably long periods of time, such as a year. Also, two types of different dual listed companies were identified. In this chapter further analysis regarding the volatility of dual listed Chinese companies was performed. The same type of volatility models that work well for the majority of companies seems to work well for the second type of companies identified in previous chapters (state-owned banks and related companies).

Given that volatility is frequently identified in finance with risk and the obvious advantages for a practitioner of having a better grasp of the risks involved when trading this type of stocks an in-depth analysis of volatility was performed. One of the first obvious questions when analyzing volatility is the issue of ARCH effects. The analysis shows that ARCH effects appears in the vast majority of the dual listed companies analyzed and this holds true for A-share and H-share log returns as well as for the spreads. After knowing that there are ARCH effects the next step was modeling the variance (accounting for clustering). Clustering is a well-known event observed by traders. The idea is rather simple, the volatility in previous moments, typically daily or intraday data, tends to impact the current volatility i.e. if a development, such as an earnings announcement, caused considerable volatility in the returns of a stock yesterday the volatility of the stock today is also likely elevated. The rationale behind performing this analysis at a company level rather than at an index level is clear. It is reasonable to assume that at an index level there is some information lost (there is no granularity) and given the radically different characteristics of the companies included in the index it is very questionable that the results obtained at an index level can be extrapolated with accuracy to any given company .

A commonly used technique in this type of situation, which account for ARCH effect, are the GARCH(P,Q) models. Obviously there remains the task of identifying what GARCH(P,Q) model to use and to check if there are differences among the two types of companies that we have identified in previous chapters regarding what GARCH(P,Q) model to use. To this

regard a GARCH(1,1) model was compared to a GARCH(2,1) for the log returns of all the A-shares, H-shares and spreads (entire set of dual listed companies that have at least one year track record when the analysis was performed). The results indicate that there does not seem to be a statistically significant difference between the two types of stocks (the ones that an experienced practitioner could theoretically achieve a profitable arbitrage and the other sector in which an arbitrage opportunity seems rather unlikely). The analysis shows that for the vast majority of the log returns of A-shares, H-shares and spreads a GARCH(2,1) model is not superior to a GARCH(1,1). Another interesting result is that two companies with similar business models and sizes (what a financial analyst would call "good comparables") are, surprisingly, not necessarily best described with the same model. For instance, China Southern Airlines and China Eastern Airlines are rather similar companies. Both airlines have similar business models, they are both mostly China domestic airlines and have many other similarities. The analysis indicates that at a 5% significance level the GARCH(2,1) model is more appropriate for China Southern, while the opposite is true for China Eastern. These results seem to indicate that a GARCH(1,1) model is superior for the vast majority of companies, but not all and that similar dual listed companies might need different GARCH(P,Q) model i.e. similar companies are not necessarily best described with the same GARCH(P,Q) model.

6.2. Overview of ARCH and GARCH models

GARCH (Generalized Auto Regressive Conditional Heteroskedasticy) models are a generalization of ARCH (Auto Regressive Conditional Heteroskedasticity) models and are extensively used in financial time series.

ARCH(q)

In an ARCH(q) model the volatility is described as (the notation used in this section and GARCH(P,Q) section is slightly different from the original notation introduced by the authors, Engle and Bollerslev, and follows the most popular version used in Schaums exercises book series as well as in popular websites such as wiki):

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + \ldots + \alpha_q \varepsilon_{t-q}^2 \quad \text{[Engle]}$$

The simplest and one of the most commonly used ARCH(q) models is the ARCH(1). For an ARCH(1) the variance is relatively easy to calculate. This and several other properties can be found in the Schaum's book series (suggest interested readers to use this book as reference):

$$Var(a_t)=E[a_t^2]-(E[a_t])^2=E[a_t^2]=E[\sigma_t^2\varepsilon_t^2]=E[\sigma_t^2]=E[\alpha_0+\alpha_1 a_{t-1}^2]=$$

$$\alpha_0+\alpha_1 E[a_{t-1}^2]=$$

$$Var(a_t)=\alpha_0+\alpha_1 E[\sigma_{t-1}^2]$$

And the stationary condition implies

$$Var(a_t)=\alpha_0+\alpha_1 Var(a_t)$$

$$Var(a_t)-\alpha_1 Var(a_t)=\alpha_0$$

and hence

$$Var(a_t)=\frac{\alpha_0}{(1-\alpha_1)}$$

GARCH(P,Q)

Volatility σ_t^2 is described in the general GARCH(P,Q) model as

$$\sigma_t^2=\alpha_0+\alpha_1\varepsilon_{t-1}^2+\alpha_2\varepsilon_{t-2}^2+\ldots+\alpha_q\varepsilon_{t-q}^2+\beta_1\sigma_{t-1}^2+\beta_2\sigma_{t-2}^2+\ldots+\beta_p\sigma_{t-p}^2$$

[Bollerslev]

By far the most used GARCH(P,Q) model is the GARCH(1,1). The volatility of the GARCH(1,1) is modeled as:

$$\sigma^2{}_t=\alpha_0+\alpha_1 a_{t-1}^2+\beta_1\sigma_{t-1}^2$$

If $\alpha_1+\beta_1<1$ then the process has a finite unconditional variance. The quantity $p=\alpha_1+\beta_1$ is a measure if the "persistence of shock of volatility" [Carnero]. The variance can be calculated [Reider] simply by:

$$Var(a_t)=E[a_t^2]-(E[a_t])^2=E[a_t^2]=E[\sigma_t^2\varepsilon_t^2]=E[\sigma_t^2]=E[\alpha_0+\alpha_1 a_{t-1}^2+\beta_1\sigma_{t-1}^2]=$$

$$\alpha_0+\alpha_1 E[a_{t-1}^2]+\beta_1 E[\sigma_{t-1}^2]=$$

$$Var(a_t)=\alpha_0+(\alpha_1+\beta_1)E[\sigma_{t-1}^2]$$

And the stationary condition implies

$$Var(a_t)=\alpha_0+(\alpha_1+\beta_1)\,Var(a_t)$$

$$Var(a_t)-(\alpha_1+\beta_1)\,Var(a_t)=\alpha_0$$

and hence

$$Var(a_t)=\frac{\alpha_0}{1-(\alpha_1+\beta_1)}=\frac{\alpha_0}{1-p}$$

Also

$$\sigma^2_t=\alpha_0+\alpha_1 a^2_{t-1}+\beta_1\sigma^2_{t-1}=$$

$$=\alpha_0+\alpha_1 a^2_{t-1}+\beta_1(\alpha_0+\alpha_1 a^2_{t-2}+\beta_1\sigma^2_{t-2})=\alpha_0+\alpha_1 a^2_{t-1}+\beta_1\alpha_0+\beta_1\alpha_1 a^2_{t-2}+\beta^2_1\sigma^2_{t-2}=$$

$$=\alpha_0+\alpha_1 a^2_{t-1}+\beta_1\alpha_0+\beta_1\alpha_1 a^2_{t-2}+\beta^2_1(\alpha_0+\alpha_1 a^2_{t-3}+\beta_1\sigma^2_{t-3})=$$

$$=\alpha_0+\alpha_1 a^2_{t-1}+\beta_1\alpha_0+\beta_1\alpha_1 a^2_{t-2}+\beta^2_1\alpha_0+\beta^2_1\alpha_1 a^2_{t-3}+\beta^3_1\sigma^2_{t-3}=$$

$$=\alpha_0+\beta_1\alpha_0+\beta^2_1\alpha_0+\alpha_1 a^2_{t-1}+\beta_1\alpha_1 a^2_{t-2}+\beta^2_1\alpha_1 a^2_{t-3}+\beta^3_1\sigma^2_{t-3}=$$

$$=\alpha_0(1+\beta_1+\beta^2_1)+\alpha_1(a^2_{t-1}+\beta_1 a^2_{t-2}+\beta^2_1 a^2_{t-3})+\beta^3_1\sigma^2_{t-3}=$$

Continuing the iteration process:

$$=\alpha_0(1+\beta_1+\beta^2_1+\ldots)+\alpha_1(a^2_{t-1}+\beta_1 a^2_{t-2}+\beta^2_1 a^2_{t-3}+\ldots)=$$

Now using the well know Taylor series:

$$1/(1-x) \quad -> \quad 1+x+x^2+\ldots.+x^n$$

We can write

$$=\frac{\alpha_0}{1-\beta_1}+\alpha_1(a^2_{t-1}+\beta_1 a^2_{t-2}+\beta^2_1 a^2_{t-3}+\ldots)=$$

The second component can we express as: $\sum_{i=0}^{\infty} a^2_{t-1-i}\beta^i_1$

So we have

$$\sigma^2_t=\alpha_0(1/(1-\beta_1)+\sum_{i=0}^{\infty} a^2_{t-1-i}\beta^i_1$$

6.3. Literature review

There are not that many reports covering GARCH models in the Chinese stock market at a company level. For instance, [Tsui] applies GARCH models to analyze the conditional volatility (in the Shanghai and Shenzhen markets). This analysis, as the majority of reports, is carried out at an index level rather than a company specific level. [Tsui] concludes that there is significant correlation in the returns of the Shanghai and Shenzhen market. It should be mentioned that Chinese companies are either listed in the Shanghai or the Shenzhen stock (they cannot be listed in both markets) and hence it is impossible to do [Tsui] analysis with dual listed companies. [Liu] compares using the Shanghai and Shenzhen indexes the GARCH-N and GARCH-SGED models, concluding that the GARCH-SED is a superior model.

There seems to be also some controversy about what model is better for Chinese stocks the

GARCH or EGARCK model with [Xu] defending the GARCH model and [Su] defending EGARCH. It should be noted that these two reports analyzed different periods and do not cover exactly the same problem but it seems that they have substantially different points of view. Our analysis focuses on different types of the differences between different GARCH models (for instance GARCH(1,1) and GARCH(2,1)) rather than comparing EGARCH and GARCH models.

There is an interesting report by [Wang] analyzing Chinese dual listed stocks through GARCH models but Wang's work focuses on A-B dual listed rather than A-H dual listed companies. Wang concludes that "a lead-lag relationship between the A-share and B-share portfolio returns is identified during our sample periods, with the A-share portfolio leading the B-share portfolio". [Jiang] performed a very interesting analysis using GARCH models. They concluded that there is a "large time-varying H-share price discount relative to A-share, and this discount is highly correlated with domestic and foreign market factors".

[Jie Zhu]'s is another interesting work analyzing dual listed Chinese companies (A-B dual listed) using GARCH-DCC models he concluded that "it is not obvious that individual B share investors hold higher market price of risk than A share investors, although for Shanghai market the averaged difference for market price of risk is still positive and significant"
[Fung] analyzed, using GARCH models, 10 dual listed Chinese companies (in Hong Kong and ADRs in the US). Fung shows that they are indications of "volatility spillovers" from the US to Hong Kong.

6.4. Analysis

An ARCH was performed in all the companies to determine the existence of ARCH effects. The ARCH test was performed in the A-share and H-share log returns as well as the spread. In the Matlab notation and output of H=1 means that the Null hypothesis is rejected. The Null hypothesis is the no existence of ARCH effects. In that case it seems reasonable to model to use a GARCH(P,Q) model. Then GARCH(1,1) model was compared to a GARCH(2,1) with a likelihood ratio test . The results of the test seems to indicate that a GARCH(2,1) is not a better model than the GARCH(1,1) (for the H-share, A-share log returns and the spreads).

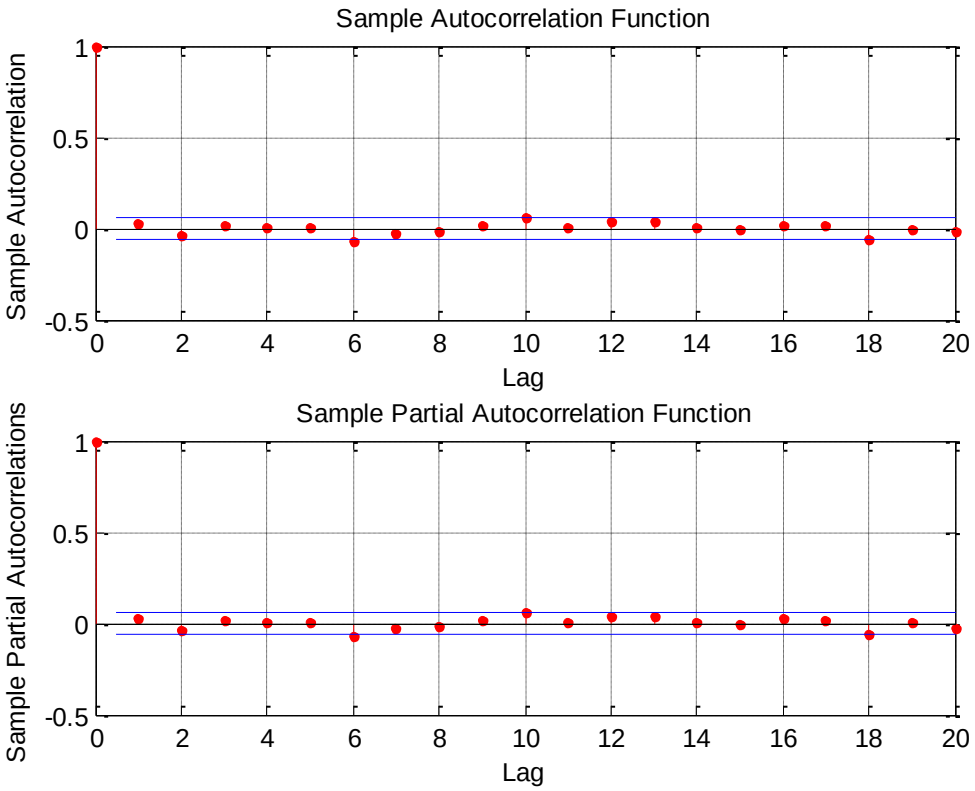
Table 40- ARCH test and GARCH(1,1) and GARCH(2,1)

Company	Arch Test	GARCH Comparison		Company	Arch Test	GARCH Comparison	
	H	H	P		H	H	P
Air China	1	0	0.1482	Datang International	1	1	0.0064
Air China D	1	0	1.0000	Datang International D	1	0	0.1136
Air China H	1	0	1.0000	Datang International H	1	1	0.0374
Aluminum of China	1	0	0.0289	Dongfang	1	0	0.2807
Aluminum of China D	1	0	0.9859	Dongfang D	1	1	0.0000
Aluminum of China H	1	0	0.1336	Dongfang H	0	1	0.0000
Angang Steel	1	0	0.9145	Guansheng Intl	1	0	0.3966
Angang Steel D	1	0	0.6034	Guansheng Intl D	1	0	0.1126
Angang Steel H	1	0	0.1913	Guansheng Intl H	1	0	0.1358
Anhui Conch	1	0	0.7037	Guangzhou Pharma	1	0	0.2791
Anhui Conch D	1	0	0.2506	Guangzhou Pharma D	0	1	0.0021
Anhui Conch H	1	0	0.0007	Guangzhou Pharma H	0	0	1.0000
Anhui Highway	1	0	1.0000	Guangzhou Shippyard	1	0	0.5708
Anhui Highway D	1	0	0.3773	Guangzhou Shippyard D	1	1	0.0491
Anhui Highway H	1	0	0.7494	Guangzhou Shippyard H	1	1	0.0000
Bank of China	1	0	1.0000	Huaneng	1	0	0.9869
Bank of China D	1	0	0.9708	Huaneng D	1	0	0.8411
Bank of China H	1	0	0.4347	Huaneng H	1	1	0.0083
Bank of Communications	1	0	0.0025	Huddiang Power	1	0	0.1812
Bank of Communications D	1	0	0.3262	Huddiang Power D	1	0	0.8928
Bank of Communications H	1	0	0.8968	Huddiang Power H	1	0	0.1812
Beijing North Star	1	0	0.1490	ICBC	1	1	0.0166
Beijing North Star D	1	0	0.9737	ICBC D	1	0	1.0000
Beijing North Star H	1	0	0.9978	ICBC H	1	0	0.4810
China Coal Energy	1	0	0.1160	Jiangxi Copper	1	1	-
China Coal Energy D	1	0	1.0000	Jiangxi Copper D	1	1	0.4321
China Coal Energy H	1	0	0.9881	Jiangxi Copper H	1	1	0.0091
China Construction Bank	1	0	0.7785	Jianxu Expressway	1	0	0.1144
China Construction Bank D	1	0	0.7777	Jianxu Expressway D	1	0	0.1395
China Construction Bank H	1	0	0.7776	Jianxu Expressway H	1	1	0.0386
China COSCO	1	0	0.0728	Jingwei textile	0	1	0.0000
China COSCO D	1	0	0.1431	Jingwei textile D	0	0	0.9903
China COSCO H	1	1	0.0005	Jingwei textile H	1	1	0.0000
China Eastern	1	0	0.4527	Northeast Elec Devt	1	0	0.3088
China Eastern D	0	1	0.0108	Northeast Elec Devt D	1	1	0.0384
China Eastern H	1	0	0.1597	Northeast Elec Devt H	1	1	0.0018
China Merchants	1	0	0.4516	PetroChina	1	0	0.6418
China Merchants D	1	0	0.0668	PetroChina D	1	0	0.9932
China Merchants H	1	0	0.9766	PetroChina H	1	0	0.5085
China Oilfield	1	0	1.0000	Shangdong Pharma	1	0	0.2421
China Oilfield D	1	0	0.9935	Shangdong Pharma D	1	1	0.0471
China Oilfield H	1	0	0.9941	Shangdong Pharma H	1	1	0.0483

China Petroleum	1	0	0.0670	Shangdong Chenming	1	0	1.0000
China Petroleum D	1	1	0.0028	Shangdong Chenming D	1	0	0.2873
China Petroleum H	1	0	1.0000	Shangdong Chenming H	1	0	0.7915
China Railway	1	0	0.3298	Shenji Group	0	0	1.0000
China Railway D	1	0	0.9869	Shenji Group D	1	0	1.0000
China Railway H	1	0	9,815.0000	Shenji Group H	1	0	1.0000
China Shenhua	1	0	1.0000	China Coal Energy	1	0	0.1160
China Shenhua D	1	0	0.7312	China Coal Energy D	1	0	1.0000
China Shenhua H	1	0	1.0000	China Coal Energy H	1	0	0.9881
China Shipping Container	1	0	1.0000	Chongqingiron & Steel	1	0	0.2556
China Shipping Container D	1	0	0.2828	Chongqingiron & Steel D	1	0	0.4254
China Shipping Container H	1	0	0.9966	Chongqingiron & Steel H	1	0	0.7919
China Southern Airlines	1	0	1.0000	CITIC A	1	0	0.9553
China Southern Airlines D	1	0	0.4325	CITIC D	1	0	0.9862
China Southern Airlines H	1	0	0.3779	CITIC H	1	0	0.9920

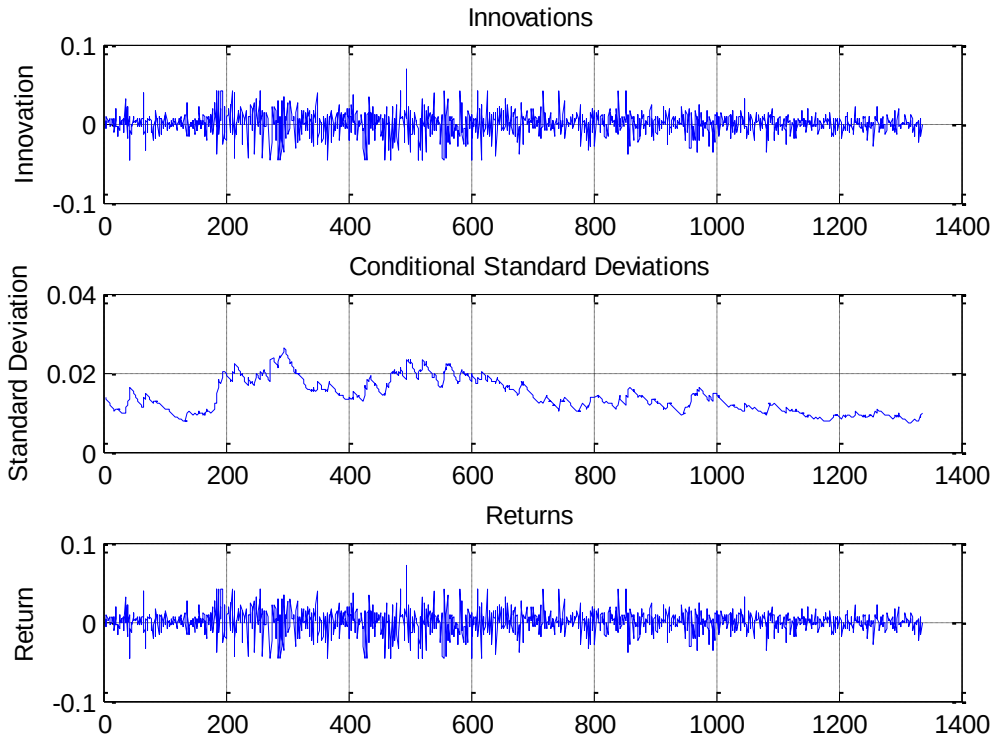
A selection of the results for some of the companies analyzed is shown below. The rest of companies are shown in the Appendix 13.

Shangdong pharmaceutical	Shangdong pharmaceutical A



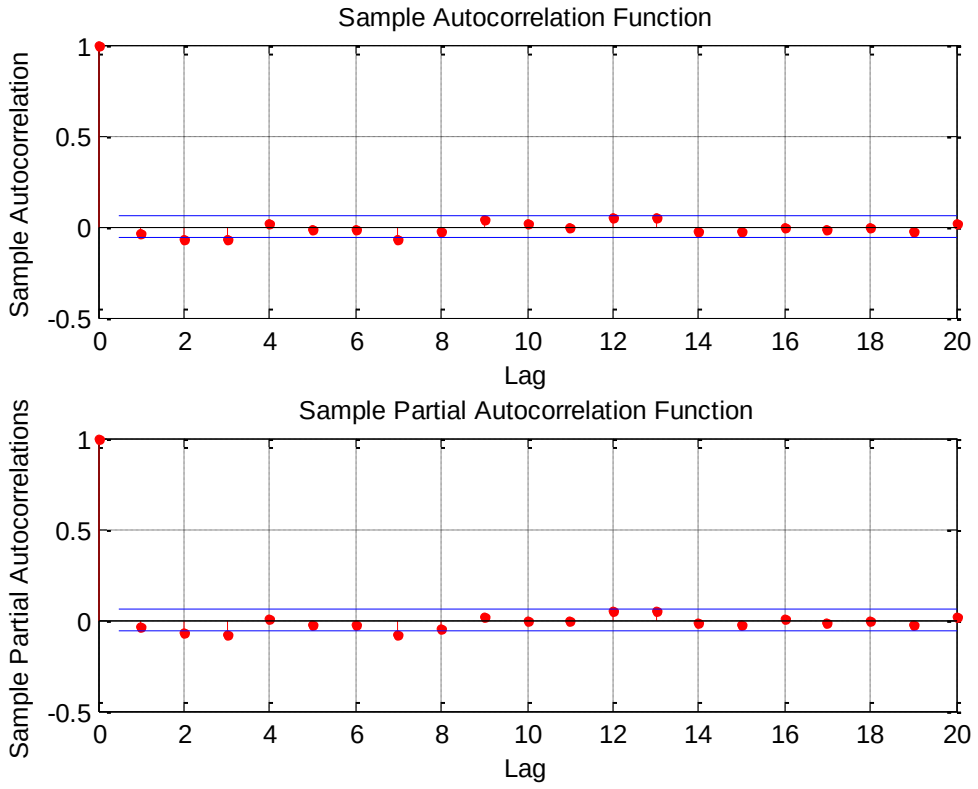
ARCH Test	
H	1
P	2.2204e-016
Fstat	121.0898
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	8.8958e-005	0.00033945	0.2621
K	1.1352e-006	4.6115e-007	2.4617
GARCH(1)	0.951	0.00698	136.2461
ARCH(1)	0.043866	0.0064362	6.8155
Log Likelihood value	3879.17		



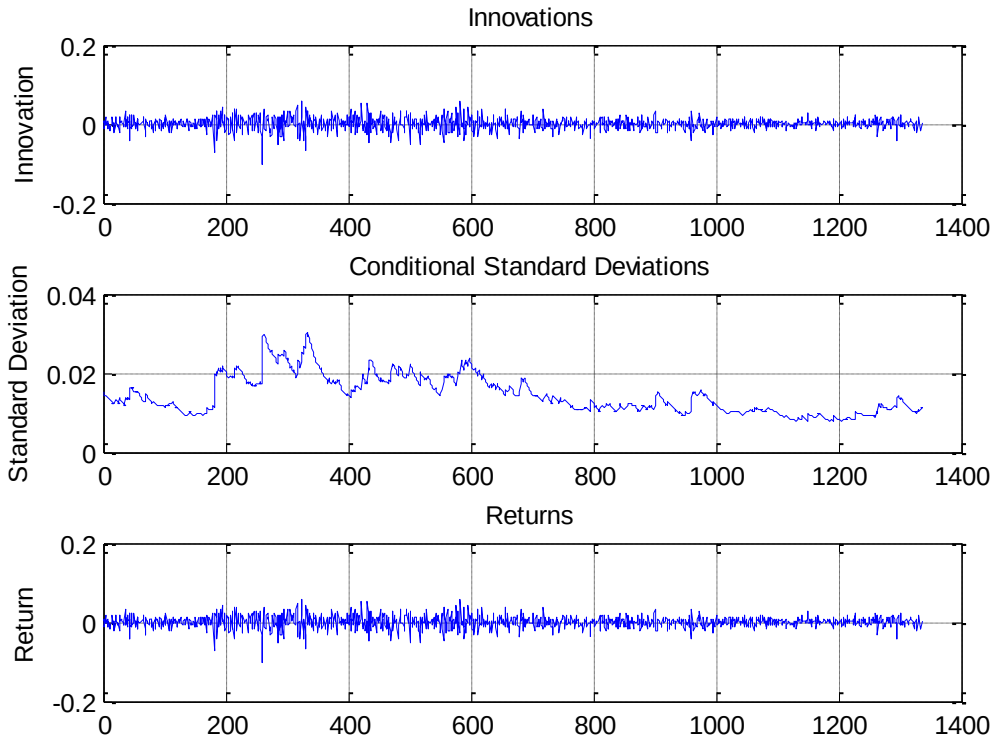
GARCH Comparison	
H	0
P	0.2421

Shangdong pharmaceutical	Shangdong pharmaceutical D



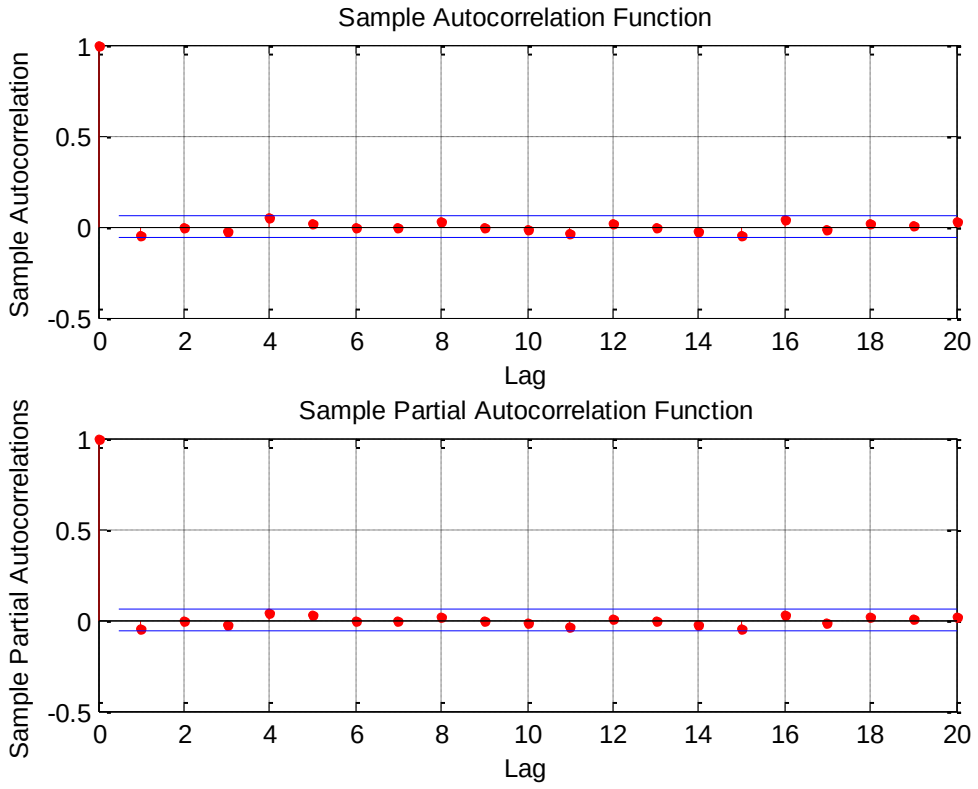
ARCH Test	
H	1
P	2.6312e-014
Fstat	109.3064
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-3.1534e-005	0.00034493	-0.0914
K	1.4104e-006	4.4999e-007	3.1343
GARCH(1)	0.94528	0.0086789	108.9165
ARCH(1)	0.049171	0.008007	6.1410
Log Likelihood value	3837.59		



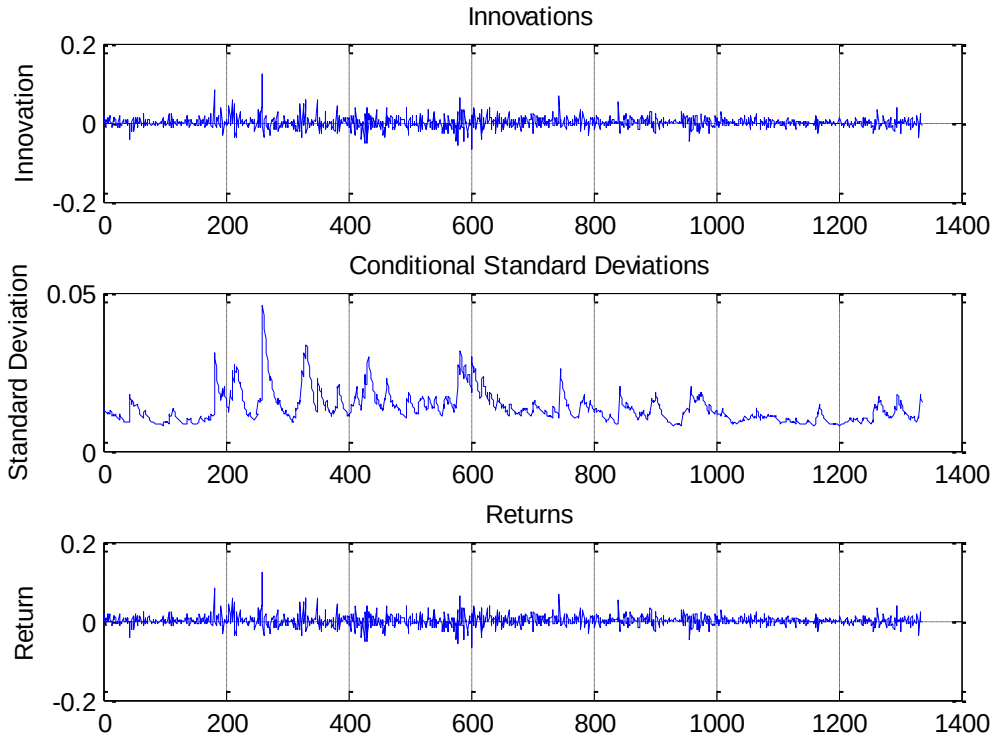
GARCH Comparison	
H	1
P	0.0471

Shangdong Pharmaceutical	Shangdong Pharmaceutical H



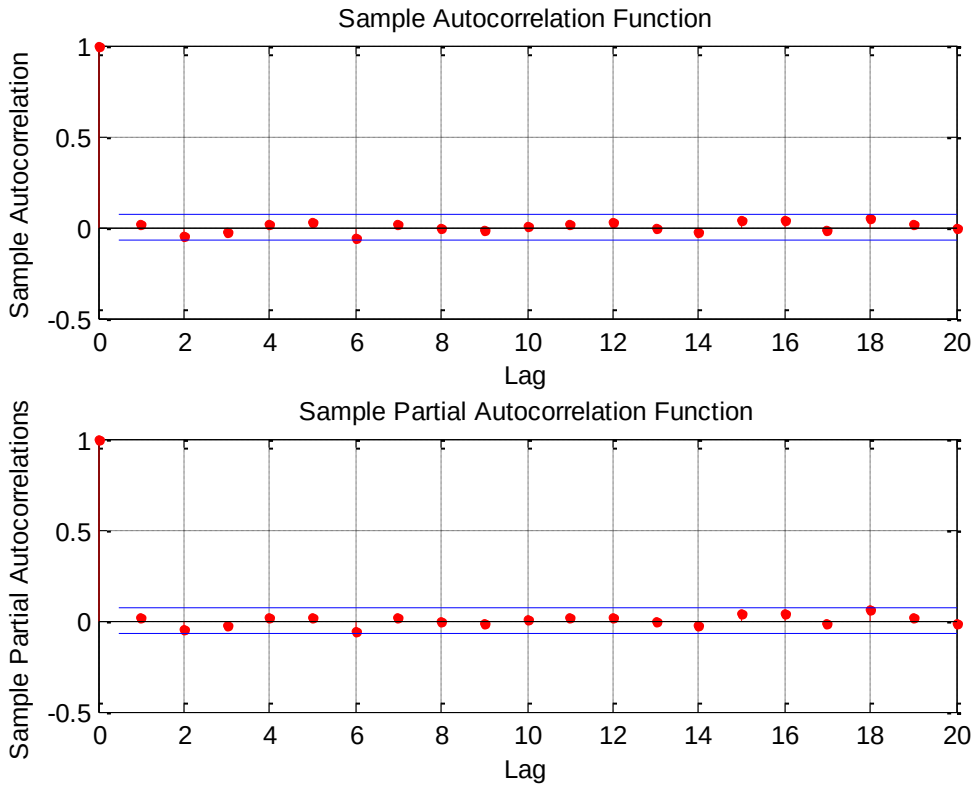
ARCH Test	
H	1
P	2.9837e-004
Fstat	49.0918
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.0001854	0.00030626	0.6054
K	8.2851e-006	8.4501e-007	9.8047
GARCH(1)	0.84559	0.0088243	95.8246
ARCH(1)	0.12086	0.0079022	15.2947
Log Likelihood value	3924.6		



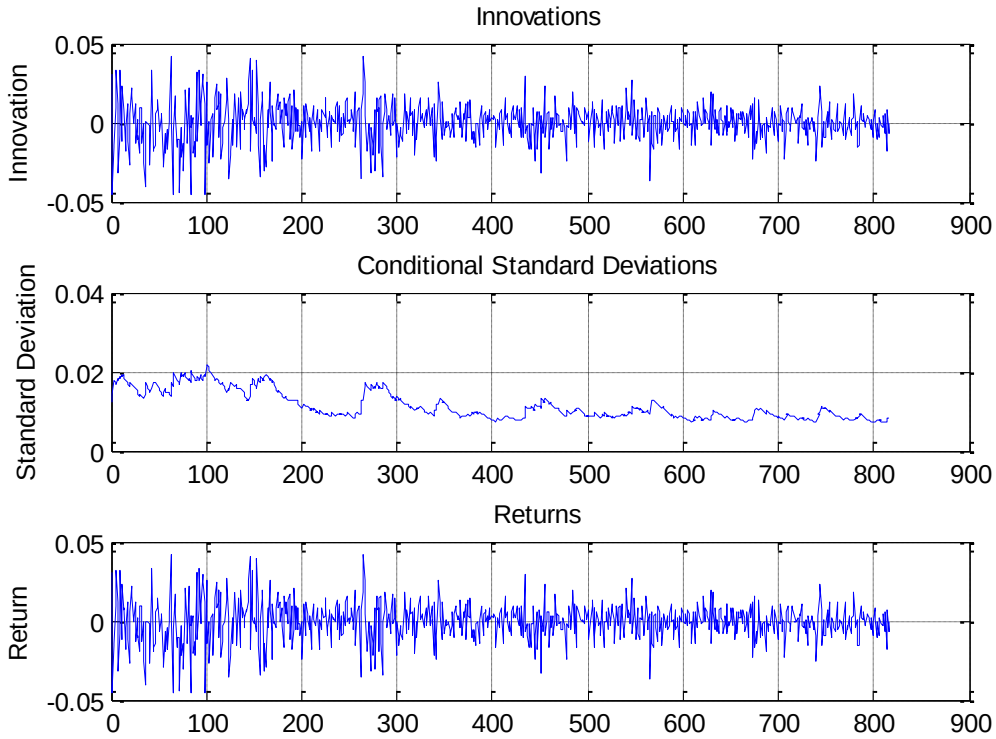
GARCH Comparison	
H	1
P	0.0483

Shangdong Chenming	Shangdong Chenming A



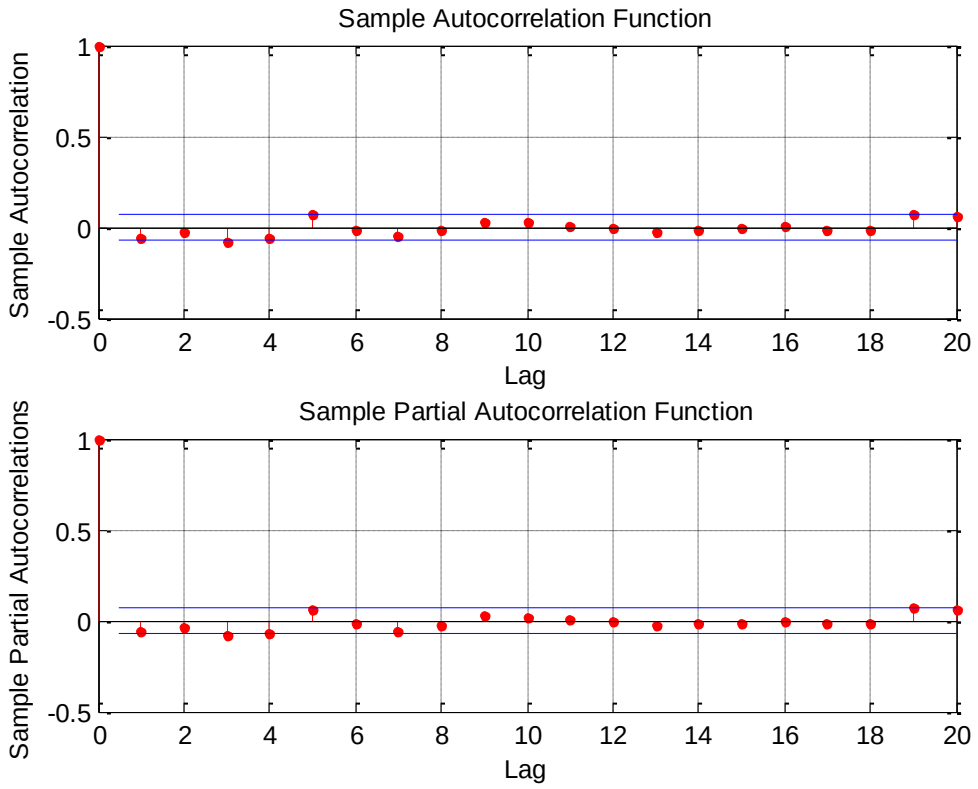
ARCH Test	
H	1
P	0
Fstat	137.4729
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00036308	0.00034672	-1.0472
K	2.1013e-006	8.3201e-007	2.5256
GARCH(1)	0.91827	0.017046	53.8693
ARCH(1)	0.064302	0.013674	4.7025
Log Likelihood value	2529.76		



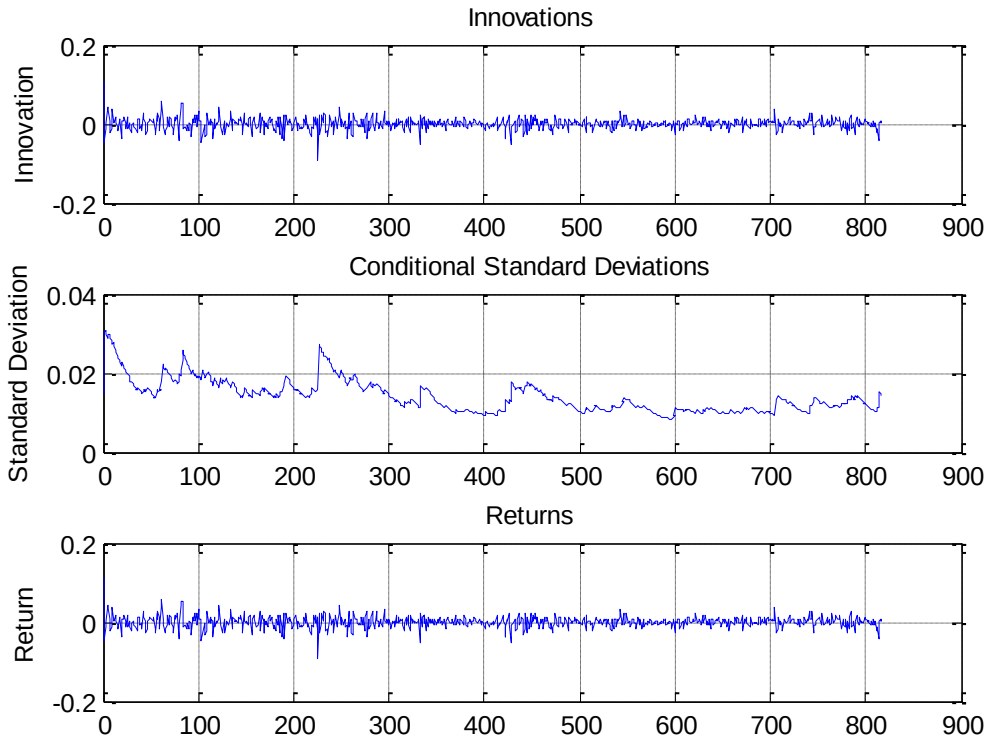
GARCH Comparison	
H	0
P	1

Shangdong Chenming	Shangdong Chenming D



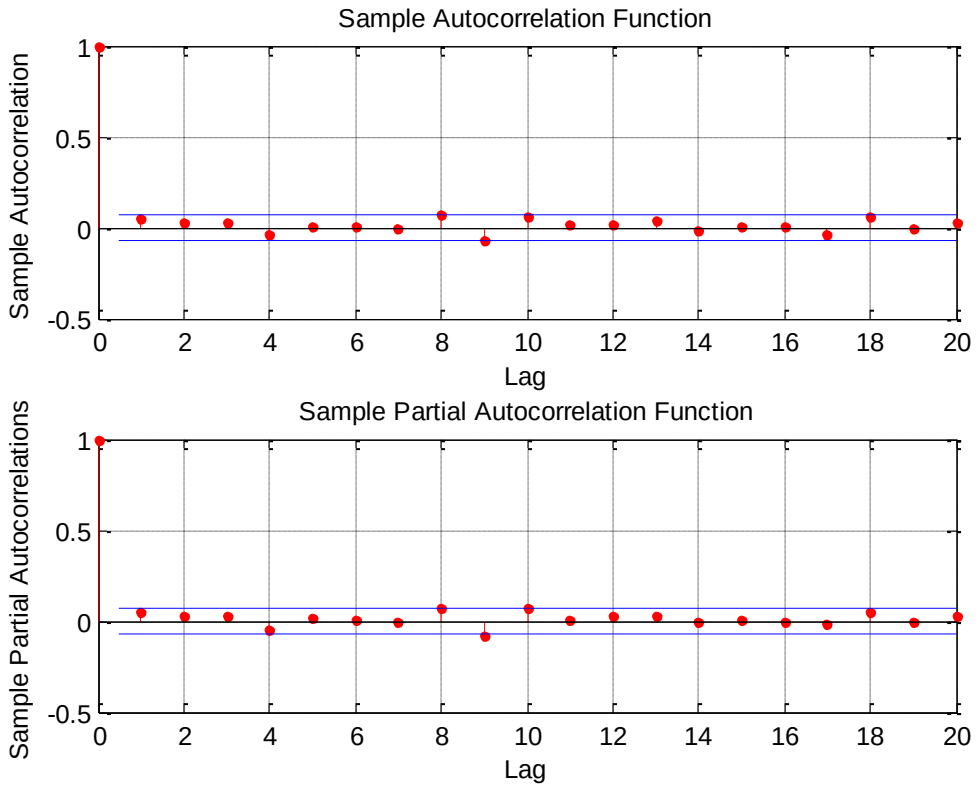
ARCH Test	
H	1
P	0.0034
Fstat	41.3141
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00013526	0.00046109	0.2934
K	3.9128e-006	1.3006e-006	3.0084
GARCH(1)	0.92225	0.01608	57.3540
ARCH(1)	0.057437	0.01138	5.0474
Log Likelihood value	2330.08		



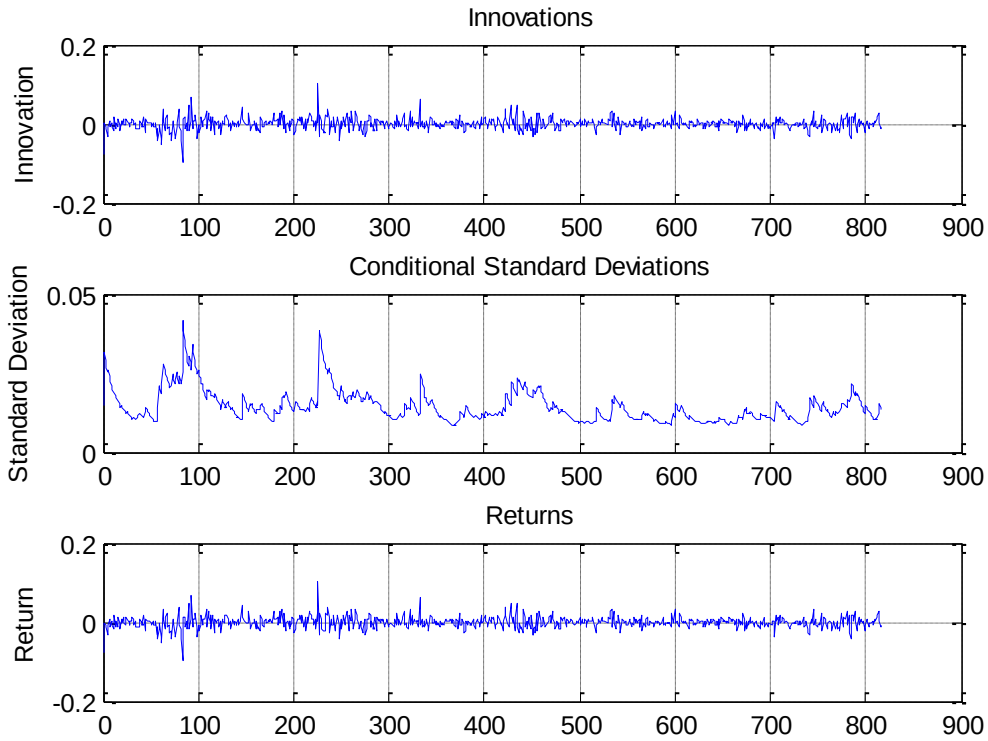
GARCH Comparison	
H	0
P	0.2873

Shangdong Chenming	Shangdong Chenming H



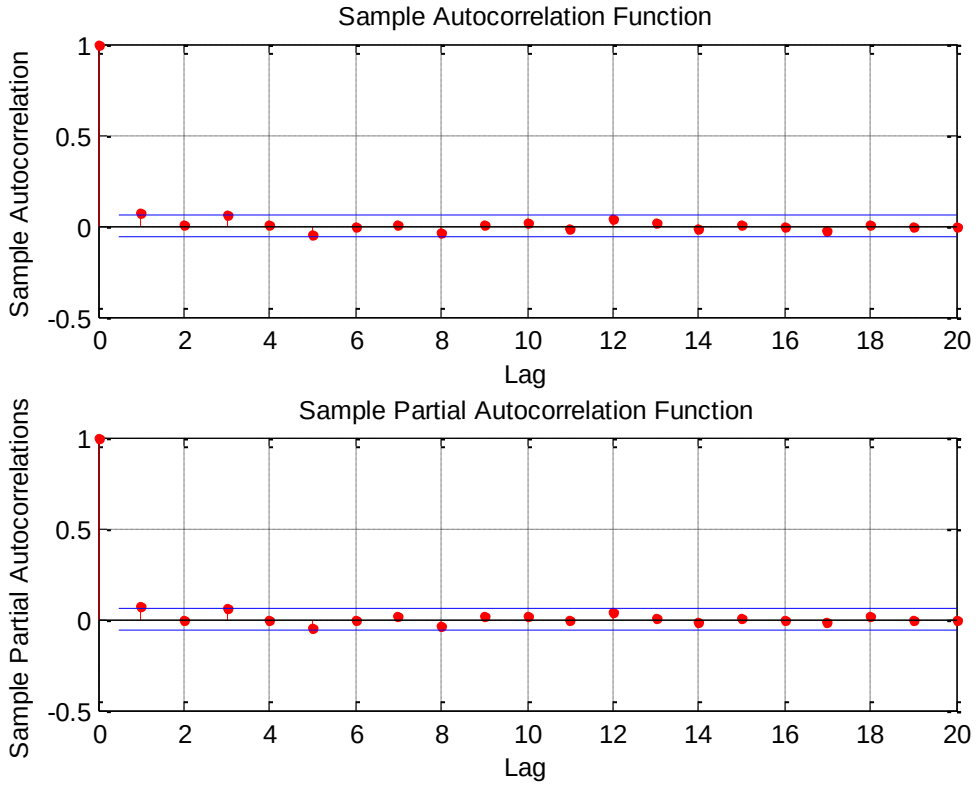
ARCH Test	
H	1
P	3.5794e-007
Fstat	68.1954
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00048307	0.00046564	-1.0374
K	9.1431e-006	2.5988e-006	3.5182
GARCH(1)	0.83918	0.026185	32.0484
ARCH(1)	0.12471	0.019653	6.3453
Log Likelihood value	2336.36		



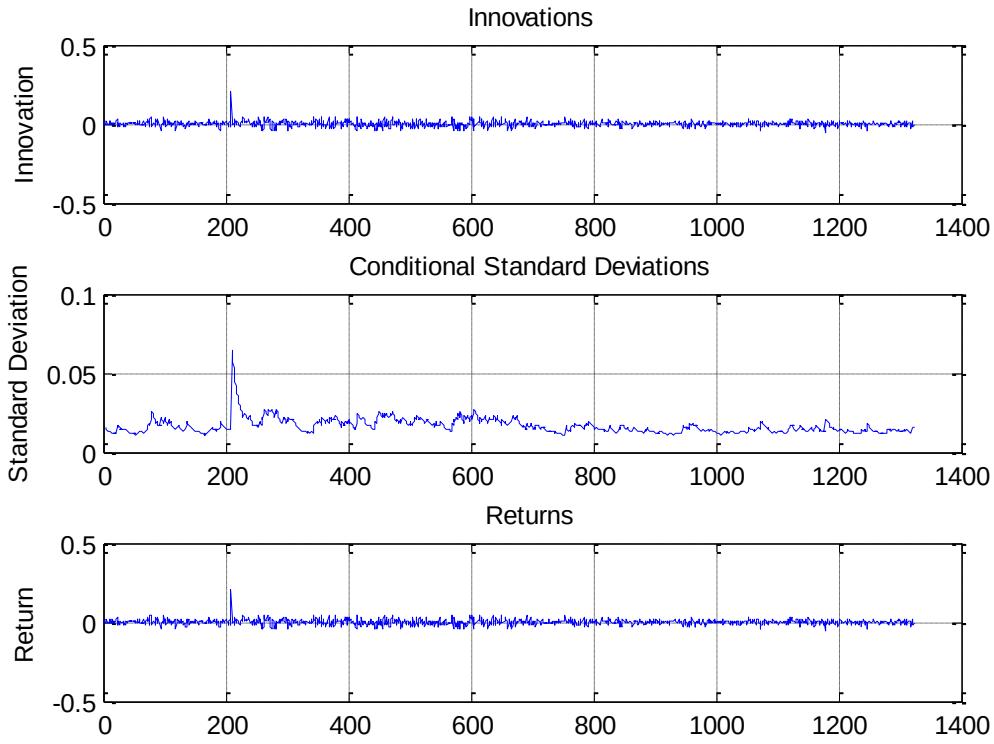
GARCH Comparison	
H	0
P	0.7195

Shenji Group	Shenji Group A



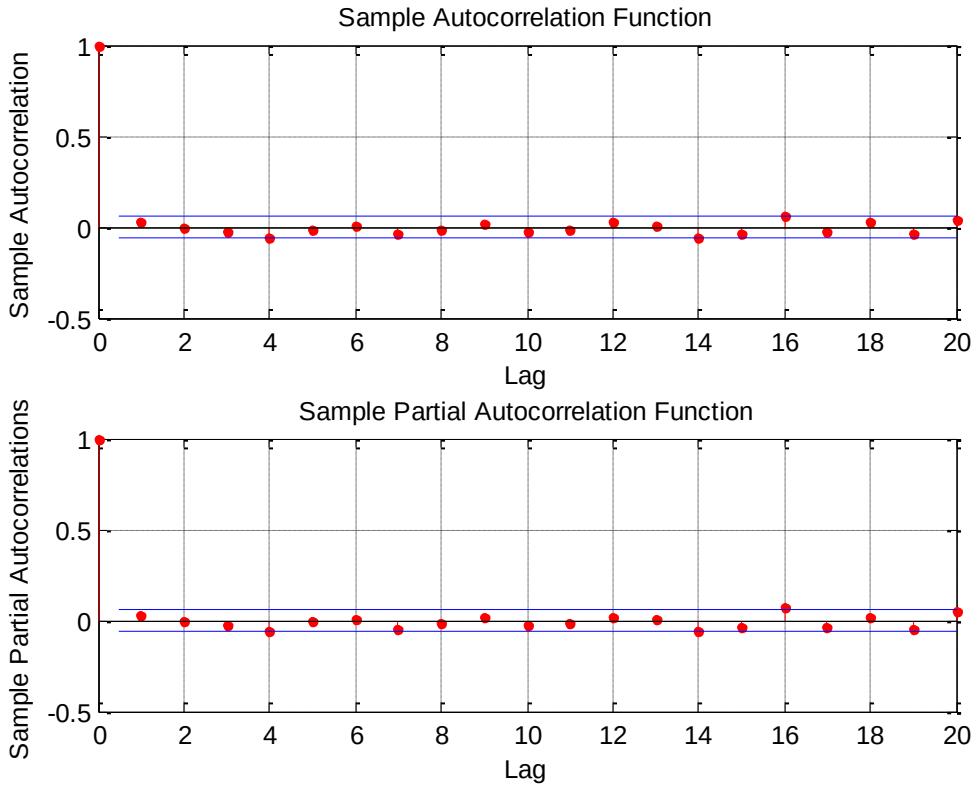
ARCH Test	
H	0
P	0.9978
Fstat	6.5879
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00019515	0.00044203	0.4415
K	1.1667e-005	2.7545e-006	4.2358
GARCH(1)	0.87019	0.01901	45.7758
ARCH(1)	0.097857	0.011732	8.3410
Log Likelihood value	3595.71		



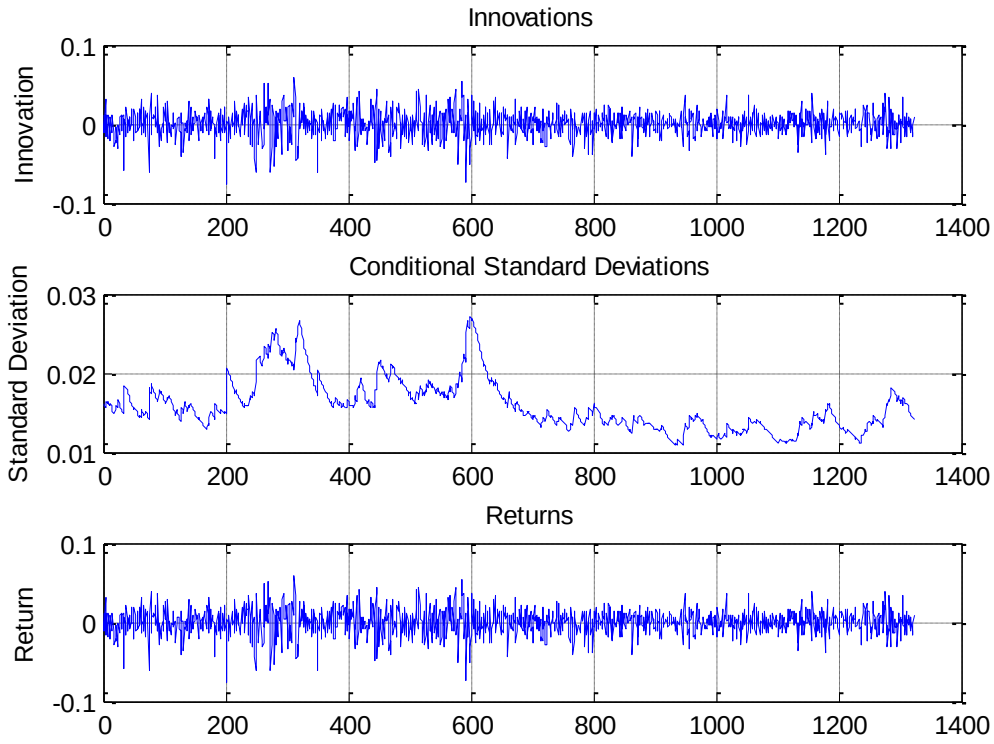
GARCH Comparison	
H	0
P	1

Shenji Group	Shenji Group D



ARCH Test	
H	1
P	3.3307e-015
Fstat	114.2140
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	1.1071e-005	0.00041758	-0.0265
K	2.7383e-006	1.0628e-006	2.5766
GARCH(1)	0.95404	0.0088534	107.7592
ARCH(1)	0.035327	0.0070829	4.9876
Log Likelihood value	3627.06		



GARCH Comparison	
H	0
P	1

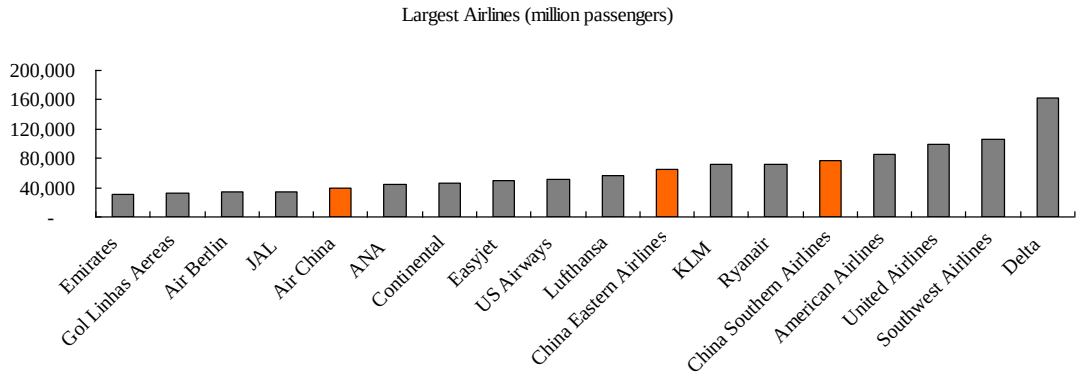
6.5. Conclusions

It seems that at a company level, for the overwhelming majority of companies, the GARCH(1,1) is an appropriate model. The ARCH test results indicate that there are ARCH effects in the analyzed data (A-share, H-share and spread) and at a 5% significance level the comparison, between the GARCH(1,1) and the GARCH(2,1), indicate that the GARCH(2,1) is not superior to the GARCH(1,1) model.

It is also interesting that in some cases, comparables companies such as China Southern Airlines and China Eastern Airlines are not represented appropriately for the same model. The GARCH(1,1) model is more appropriate for China Southern while the GARCH(2,1) is model is more appropriate for China Southern. This seems to indicate that comparable companies are not necessarily well represented by the same model and that a comparison is necessary on a case by case basis.

6.6. Case study – Airlines (Air China, China Eastern and China Southern Airlines)

The transportation sector, specifically aviation, is an interesting sector to analyze. It is obviously an important sector for the economy as an efficient transportation system has obvious benefits for the economy. The business model of airlines is relatively simple but capital intensive (purchase of planes and fuel costs).



Source: Air Transport World (ATWOnline)

Brief introduction to China Eastern Airlines

The company was founded in 1988. It is a classical airline with the bulk of its revenue, 83%, coming from passenger transportation fees (rather than cargo). As usual, for an airline, its operating expenses are mostly driven by the cost of fuel (37% of the total operating expenses). Due to current Chinese regulation the fuel price in the mainland is not the same than the international price. The company has a relatively straight forward business model potentially making it easier to model for financial analysts. The company IPO in the Hong Kong market in 1997.

2011 China Eastern Revenue Breakdown		
Segment	***Revenue (RMB 000)***	***Revenue (%)***
Traffic revenue	*76,513,636*	*93%*
Passenger	*68,433,970*	*83%*
Cargo and mail	*8,079,666*	*10%*
Ground service income	*2,104,604*	*3%*
Tour operations income	*2,115,520*	*3%*
Cargo handling income	*278,724*	*0%*
Commission income	*95,426*	*0%*
Other	*1,295,220*	*2%*
Total	*82,403,130*	*100%*

Source: directly taken from 2011 annual report

2011 China Eastern Operating Expenses Breakdown		
Segment	***OE (RMB 000)***	***OE (%)***
Fuel	*29,258,758*	*37%*
Employees	*8,642,831*	*11%*
Landing fees	*8,325,663*	*11%*
Depreciation & amortization	*6,977,698*	*9%*
Overhead	*8,880,707*	*11%*
Operating lease & rental	*4,123,185*	*5%*
Maintenance	*4,440,354*	*6%*
Selling expenses	*3,726,725*	*5%*
Other	*4,916,106*	*6%*
Total	*79,292,027*	*100%*

Source: directly taken from 2011 annual results presentation

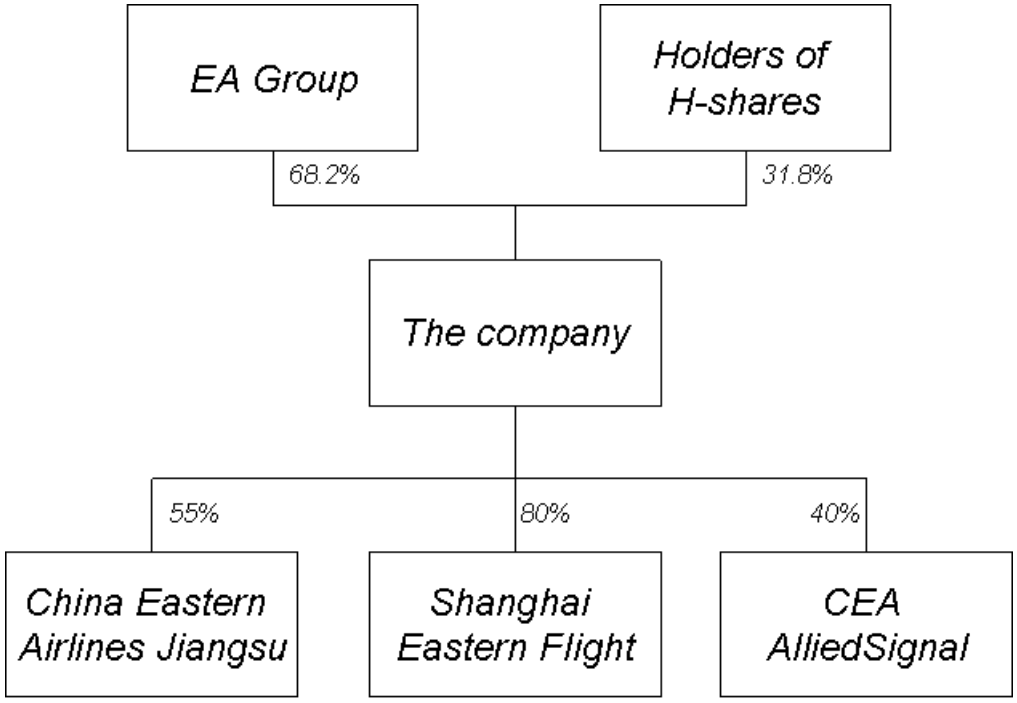
Table 41- Main Shareholders

China Eastern Airlines shareholders	
A-share	**Percentage**
China Eastern Airline Holdings	62.08%
Shanghai Lianhe Investment	5.49%
China National Aviation Fuel	5.41%
Jinggiang International Group	4.41%
Harvest Fund Management	1.36%
Aerospace Sci & Tech	1.27%
Sinotrans Air Transport	1.07%
H-share	**Percentage**
CES Global Holding	55.16%
JP Morgan	10.10%
JP Morgan Investment	0.83%
FMR LLC	0.68%
China International Fund Mgt	0.51%
Vanguard	0.45%
Grantham Mayo Van Otterloo	0.42%

Source: Bloomberg

CEA Holdings is a state-owned enterprise.

Figure 26 - China Eastern Airlines company structure (just after H-share IPO)



Source: directly taken from IPO prospectus

Brief introduction to Air China

Air China is one of the main carriers in China. Mainland China traffic remains as the core revenue generator for Air China with more than 67% of the revenue in 2011 coming from domestic flights. Employees related expenses, such as salaries and pensions, are also similar in both companies (slightly higher in Air China) with a 13% (of total operating expenses) in the case of Air China and a 11% in the case of China Eastern.

Air China revenue breakdown in 2011		
	RMB million	***(%)***
Mainland China	*66,154*	*67%*
Hong Kong, Macau and Taiwan	*4,335*	*4%*
Europe	*10,464*	*11%*
US	*6,984*	*7%*
Japan and Korea	*6,110*	*6%*
Other	*4,359*	*4%*

Source: Taken from Air China 2011 annual results

Air China has a similar cost structure to China Eastern airlines with 38% of the operating expenses for 2011 related to fuel charges (compared to 37% for China Eastern Airlines).

Air China OE breakdown in 2011		
	RMB million	***(%)***
Fuel	*34,703*	*38%*
Fuel derivatives	*-85*	*-*
Landing charges	*8,740*	*9%*
Depreciation & amortization	*9,560*	*10%*
Maintenance	*2,612*	*3%*
Employees	*12,270*	*13%*
Air catering	*2662*	*3%*
Selling expenses	*5,480*	*6%*
Administrative	*2,261*	*2%*
Other	*13,943*	*15%*

Source: Taken from 2011 company annual report.

Table 42 - Main Shareholders

Air China shareholders	
A-share	**Percentage**
CNA Holding Company	63.68%
CNA Holding Company	15.64%
China National Aviation	1.61%
Sinotrans Air Transport	0.89%
New China Life	0.80%
Guodian Capital Holding	0.56%
Guohua Life Insurance	0.51%
H-share	**Percentage**
Cathay Pacific Airways	55.30%
China National Aviation	4.91%
FMR LLC	1.38%
Vanguard	1.14%
Matthews International	0.95%
Blackrock	0.94%
Invesco	0.93%

Source: Bloomberg

CNA Holding Company is a state-owned company under the direct supervision of the State Council.

Brief introduction to China Southern Airlines

China Southern Airlines has the largest airplane fleet in Asia (in excess of 500) and it is more domestic focus than Air China or China Eastern Airlines with more than 80% of the revenue coming from Mainland China flights.

China Southern Airlines revenue breakdown in 2011		
	RMB million	***(%)***
Domestic	*75,807*	*82%*
Hong Kong, Macau and Taiwan	*1,958*	*2%*
Other	*14,942*	*16%*

Source: Taken from 2011 company annual report.

The cost structure of China Southern Airlines is slightly different from China Eastern Airlines or Air China. In the case of China Southern Airlines 69% of the expenses are fuel related compared to 37% in the case of China Eastern or 38% in the case of Air China. Employees expenses (salary and welfare) seem in line, at 10%, with its peers.

China Southern Airlines OE breakdown in 2011		
	RMB million	***(%)***
Fuel	*32,675*	*69%*
Operating lease charges	*4,654*	*10%*
Air catering expenses	*2,073*	*4%*
Aircraft insurance	*201*	*0%*
Employees	*4,412*	*9%*
CAAC fund contribution	*1,655*	*3%*
Inventory provision	*141*	*0%*
Other	*1,852*	*4%*

Source: Bloomberg

Shareholders

China Southern Airlines shareholders	
A-share	**Percentage**
China Southern Holdings	59.10%
WH Ruijian Investment Con	2.77%
AH Conch	2.51%
Xiadong Zhao	2.26%
Bosera funds	2.26%
Ping An Life Insurance	2.26%
ZH Xinggang Guarantee	2.26%
H-share	**Percentage**
Nan Lung Holding	36.98%
FMR LLC	7.76%
JP Morgan	4.80%
Vanguard	1.66%

Yazhou Group	1.11%
Blackrock	0.95%
Dimensional Fund	0.83%

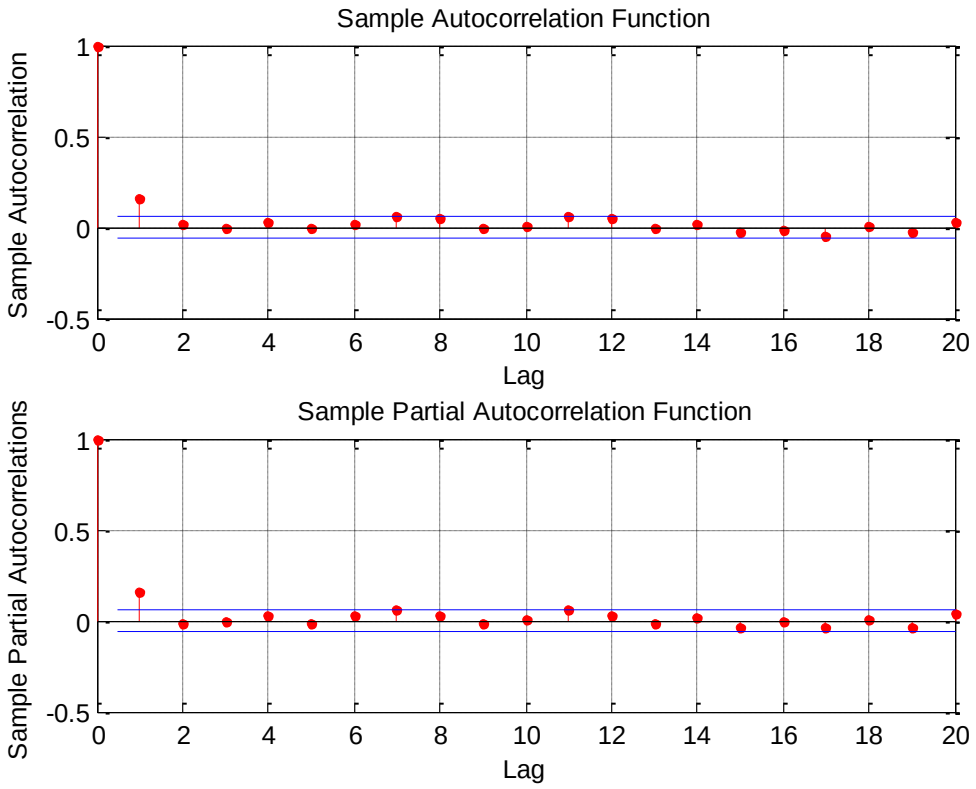
Source: Bloomberg

China Southern Holdings is a state-owned enterprise.

Analysis

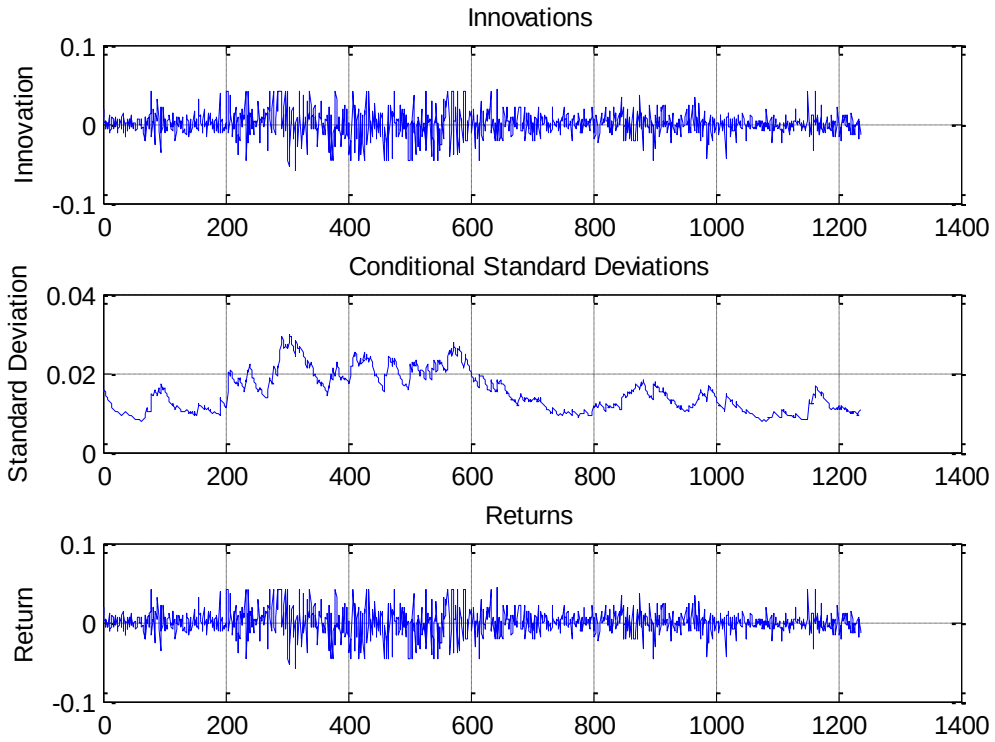
In this section the results from the ARCH test and GARCH modeling are presented for China Eastern Airlines, China Southern Airlines and Air China.

China Eastern	China Eastern A



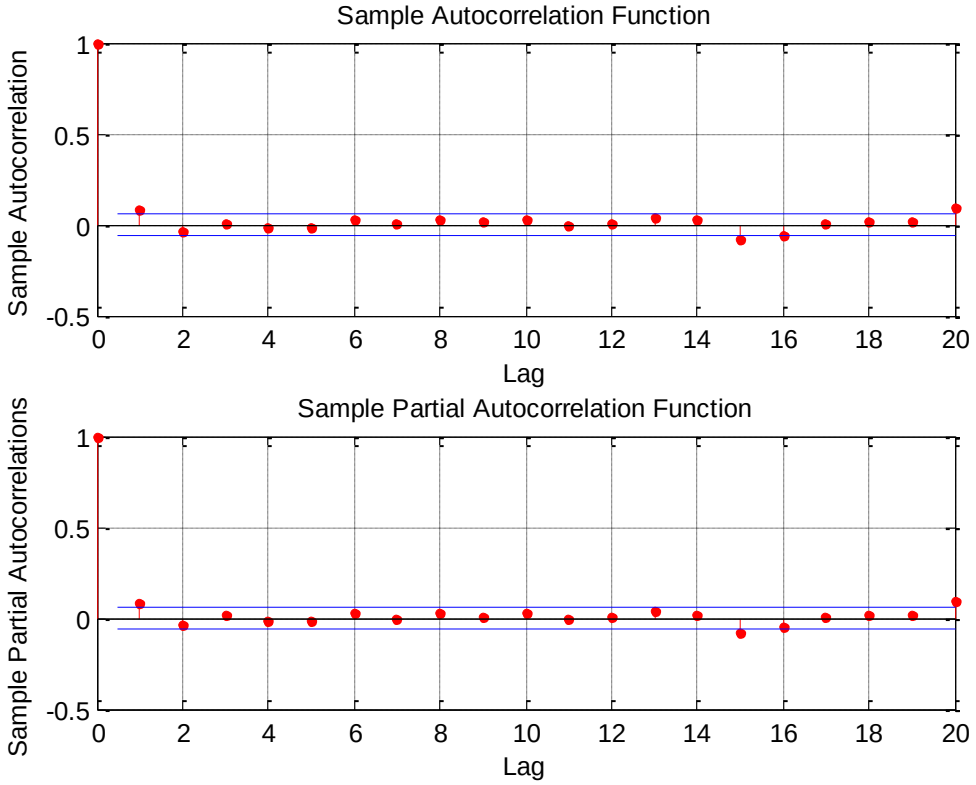
ARCH Test	
H	1
P	0
Fstat	181.8389
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-1.5713e-005	0.00038604	-0.0407
K	2.8322e-006	6.8089e-007	4.1595
GARCH(1)	0.92415	0.010511	87.9243
ARCH(1)	0.063999	0.0098196	6.5175
Log Likelihood value	3522.56		



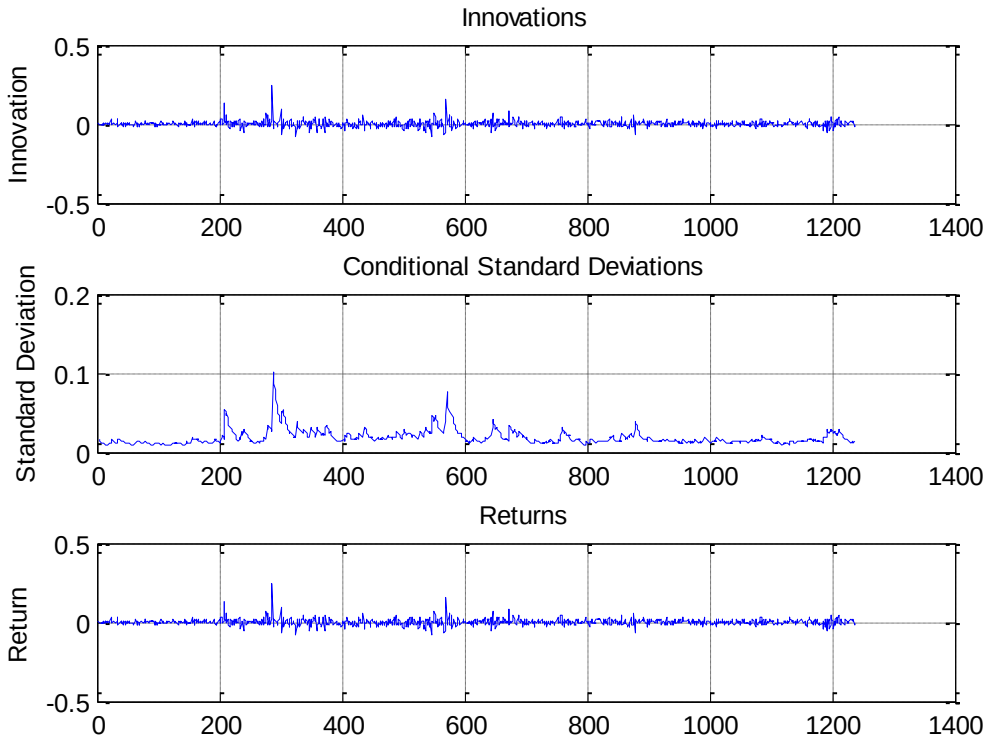
GARCH Comparison	
H	0
P	0.4527

China Eastern H	China Eastern H



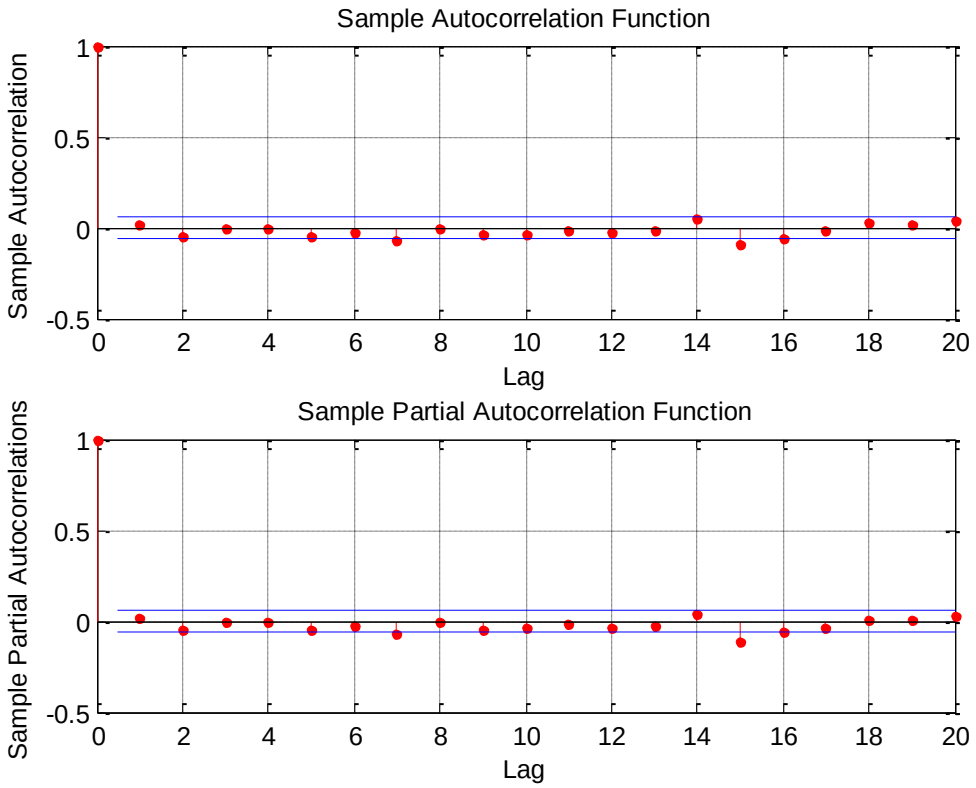
ARCH Test	
H	0
P	0.0858
Fstat	29.0983
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00012319	0.00043436	-0.2836
K	9.0649e-006	2.0081e-006	4.5143
GARCH(1)	0.82754	0.015982	51.7784
ARCH(1)	0.17246	0.016294	10.5843
Log Likelihood value	3291.52		



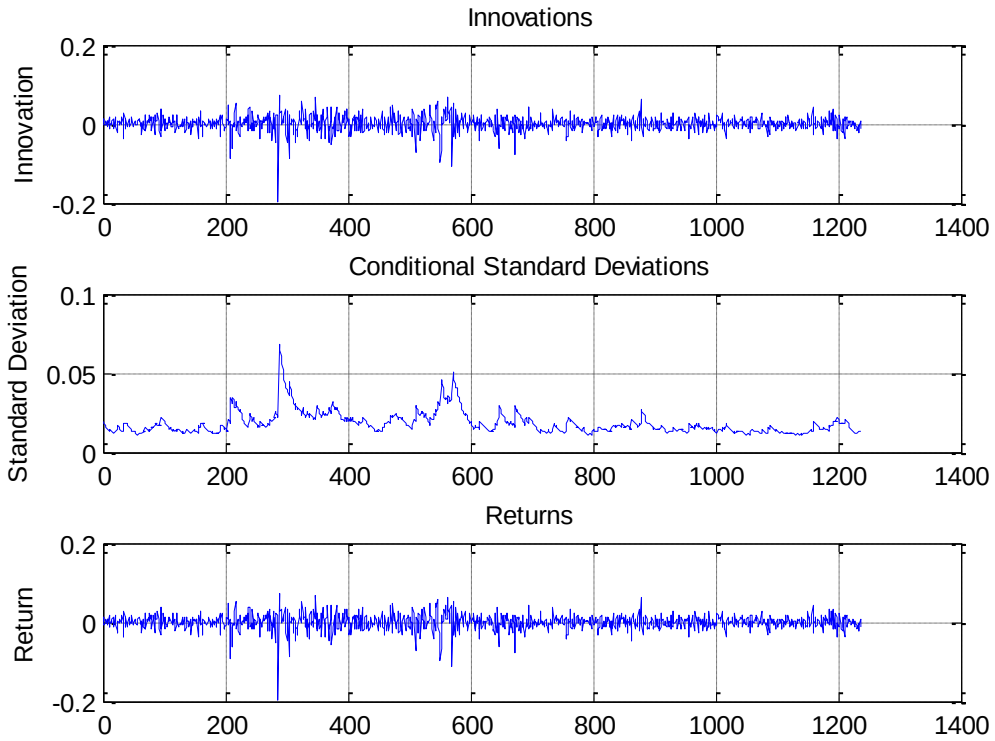
GARCH Comparison	
H	0
P	0.1597

China Eastern	China Eastern D



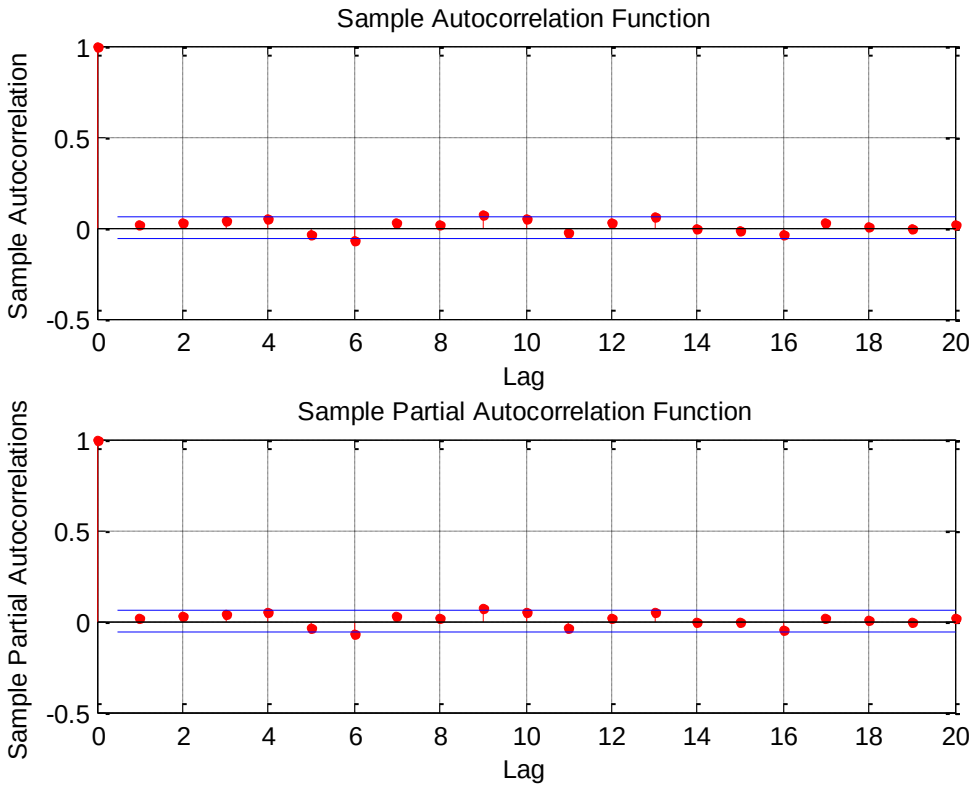
ARCH Test	
H	1
P	2.1642e-008
Fstat	75.5989
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00058305	0.00043853	-1.3296
K	8.3193e-006	2.1975e-006	3.7858
GARCH(1)	0.87659	0.015245	57.5001
ARCH(1)	0.1079	0.012917	8.3531
Log Likelihood value	3273.62		



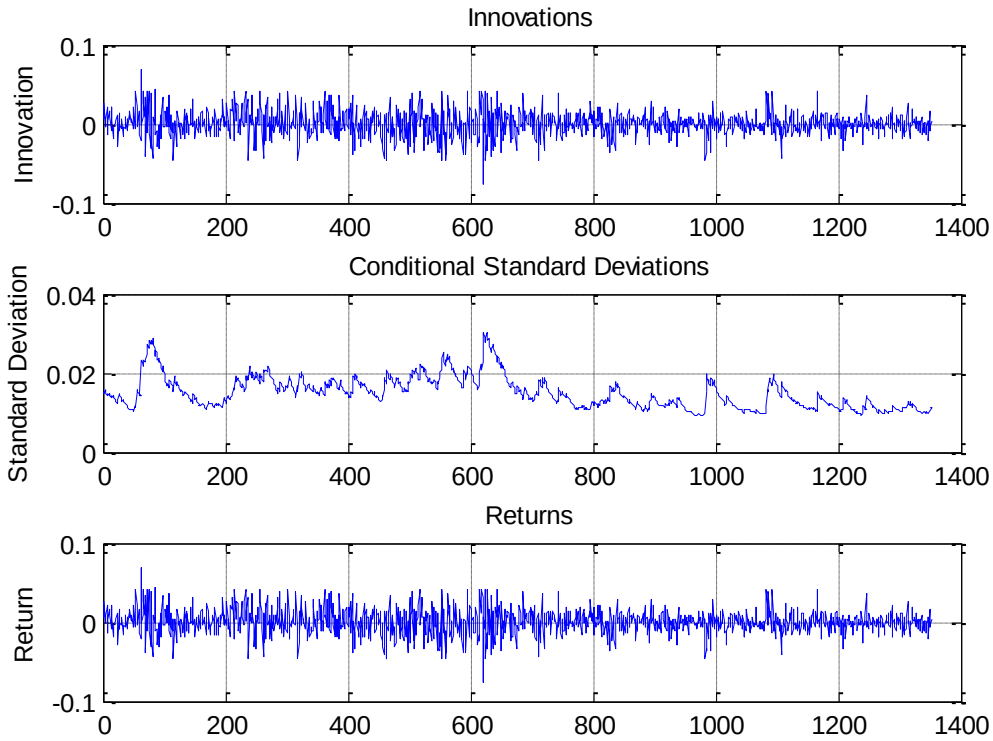
GARCH Comparison	
H	1
P	0.0108

China Southern Airlines	China Southern Airlines A



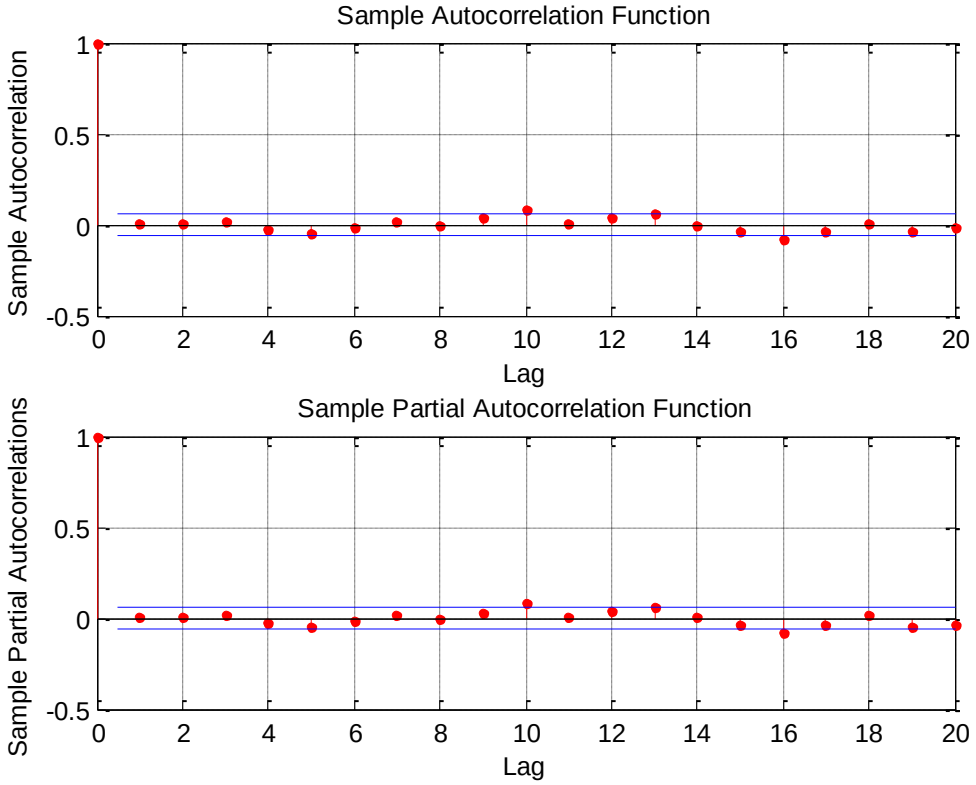
ARCH Test	
H	1
P	0
Fstat	145.4612
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00029459	0.0003678	0.8009
K	5.1731e-006	1.1783e-006	4.3904
GARCH(1)	0.90637	0.014018	64.6555
ARCH(1)	0.071785	0.011117	6.4571
Log Likelihood value	3807.5		



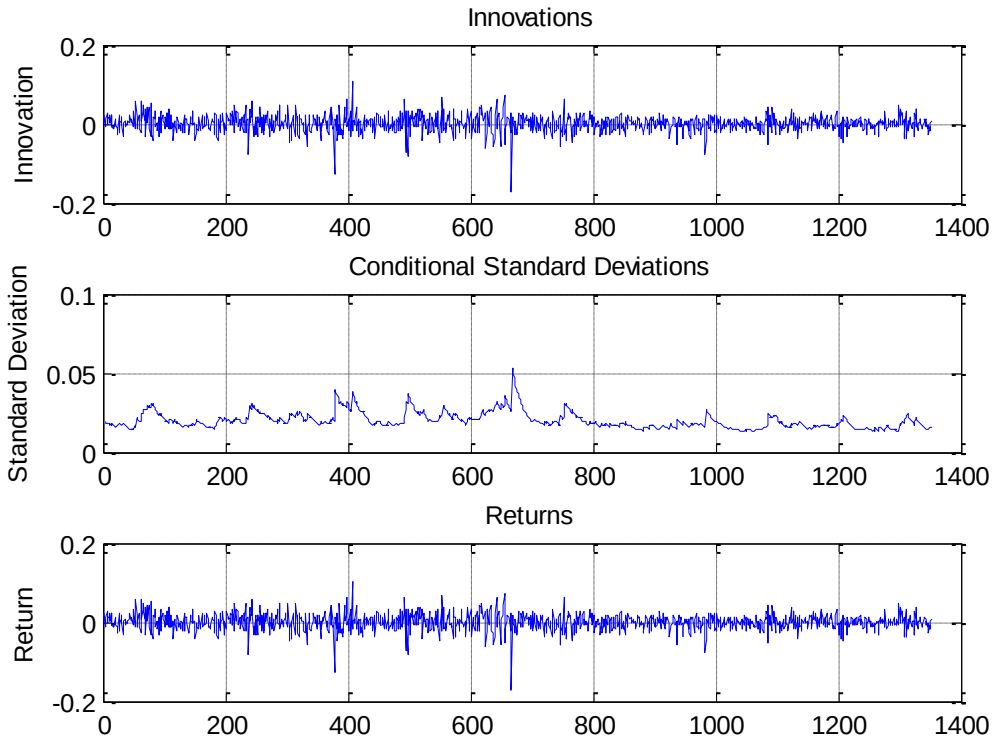
GARCH Comparison	
H	0
P	1

China Southern Airlines	China Southern Airlines D



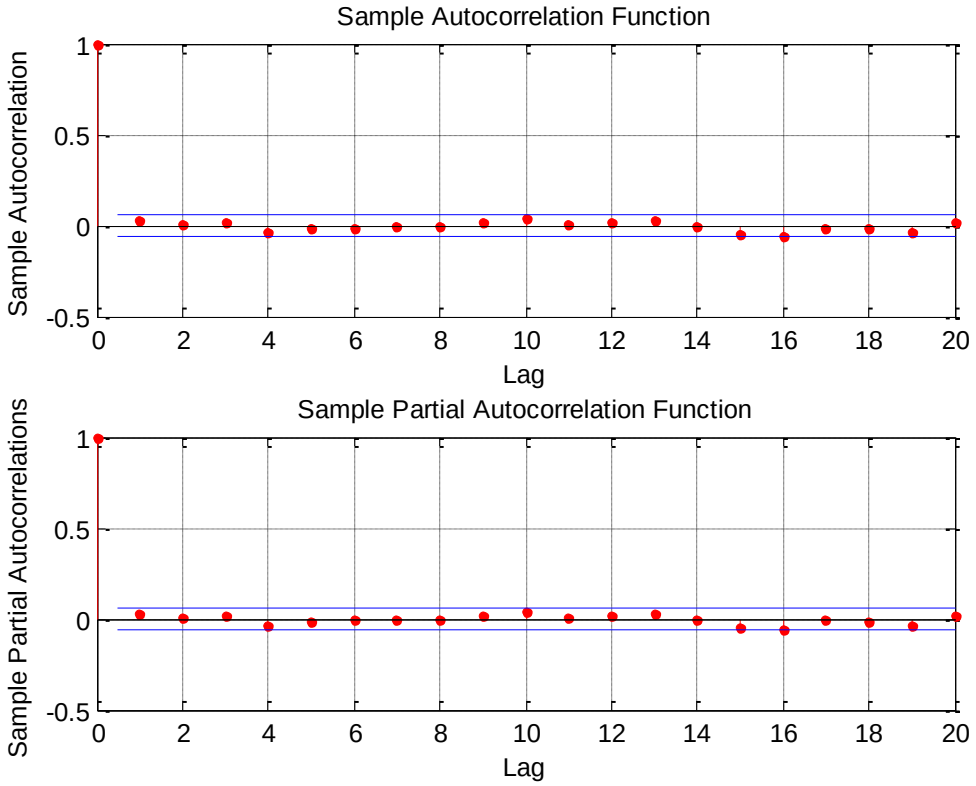
ARCH Test	
H	1
P	0.0193
Fstat	35.1540
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00046673	0.0005085	-0.9179
K	1.0385e-005	1.9777e-006	5.2508
GARCH(1)	0.90475	0.012351	73.2513
ARCH(1)	0.072991	0.011629	6.2767
Log Likelihood value	3412.33		



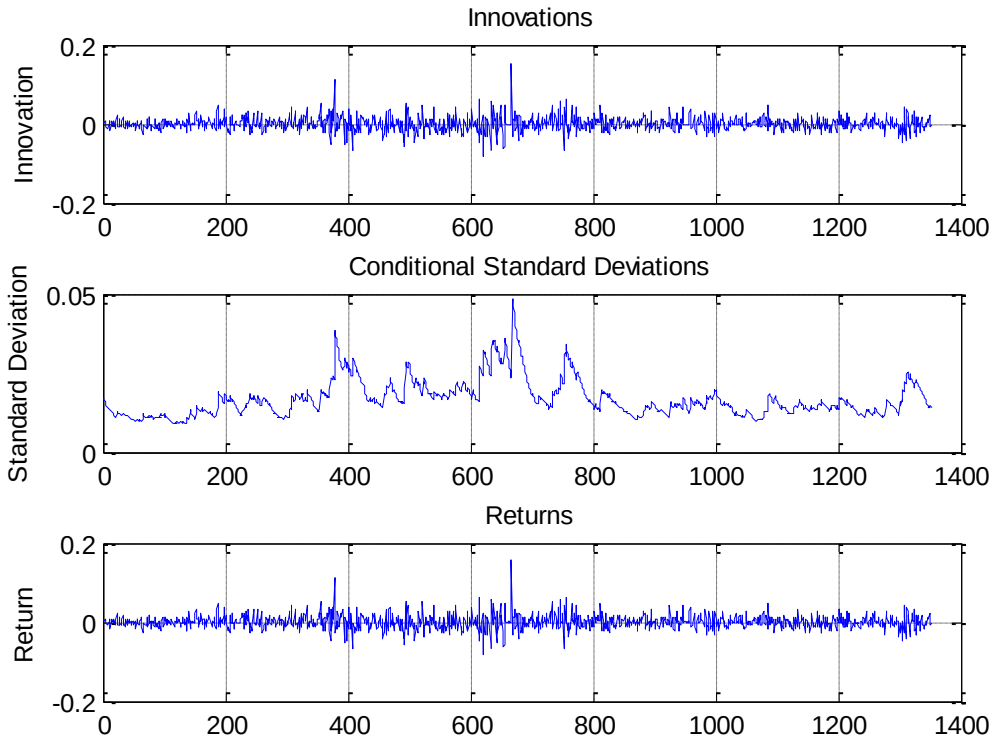
GARCH Comparison	
H	0
P	0.4325

China Southern Airlines	China Southern Airlines H



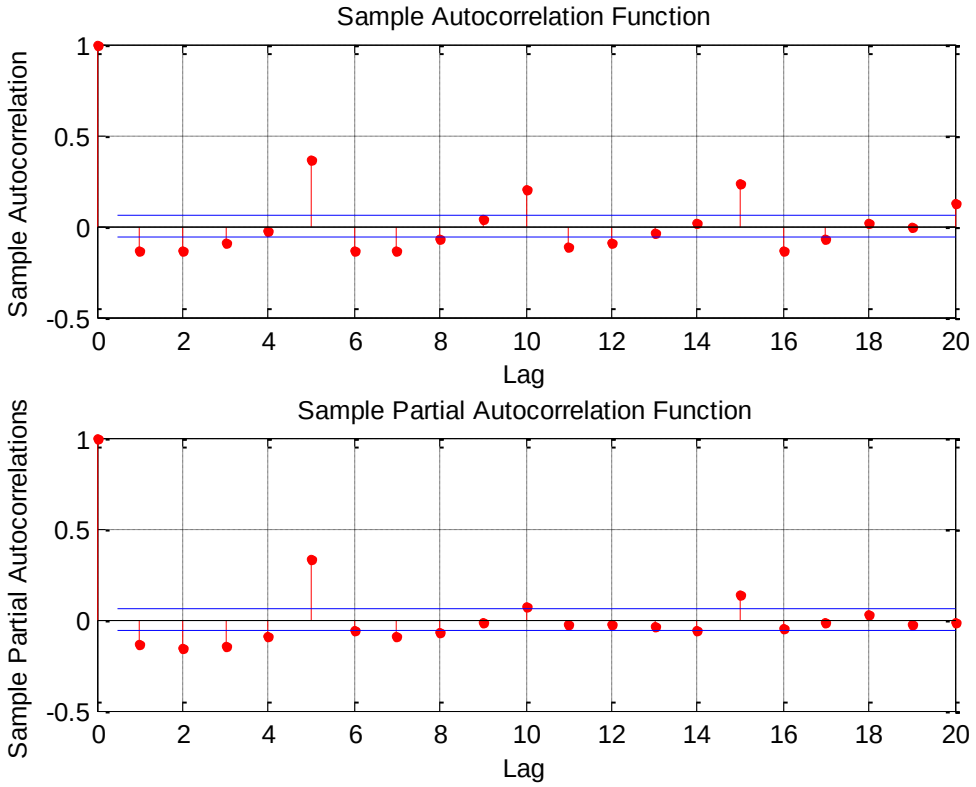
ARCH Test	
H	1
P	8.7930e-009
Fstat	77.9297
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00043015	0.00042796	1.0051
K	3.9407e-006	7.9794e-007	4.9386
GARCH(1)	0.9137	0.0067778	134.8067
ARCH(1)	0.076713	0.0084517	9.0767
Log Likelihood value	3681.44		



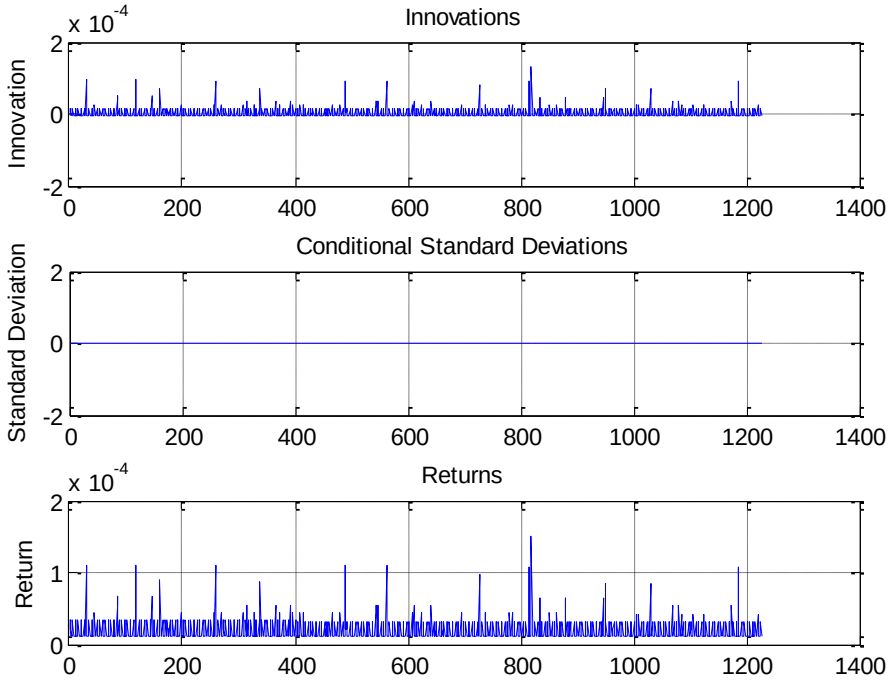
GARCH Comparison	
H	0
P	0.3779

Air China	Air China A



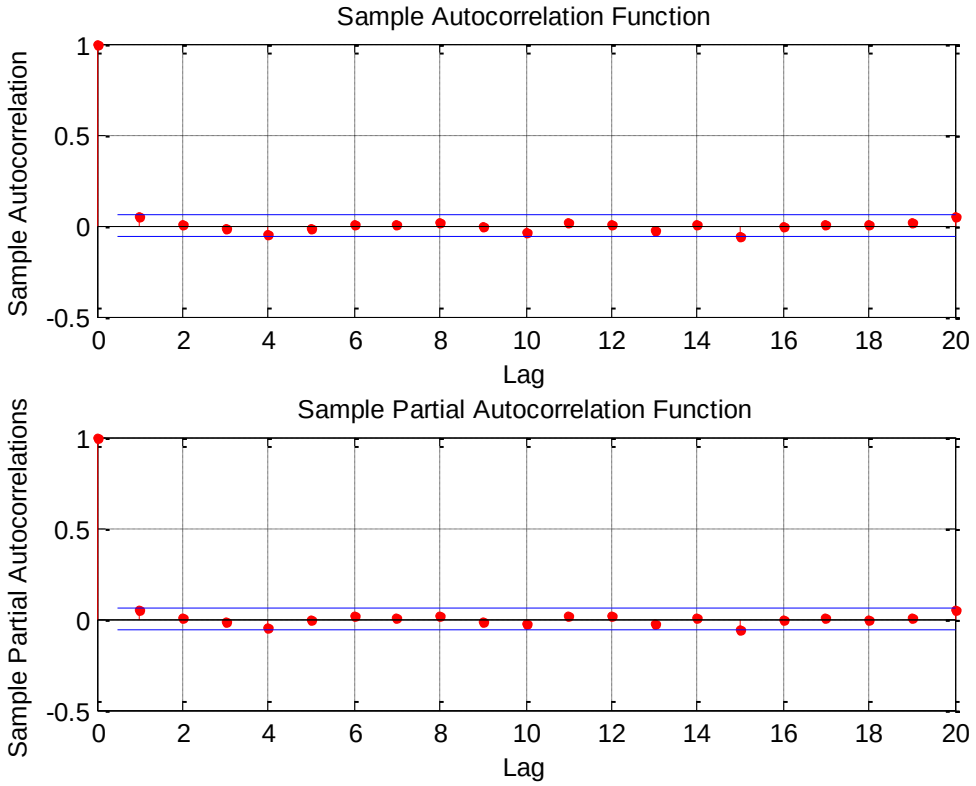
ARCH Test	
H	1
P	0.0122
Fstat	36.8547
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	1.7188e-005	0.00040999	0.0419
K	2e-007	1.1435e-008	17.4903
GARCH(1)	0	1.042e-009	0.0000
ARCH(1)	0	3.5158e-010	0.0000
Log Likelihood vakue	8328.28		



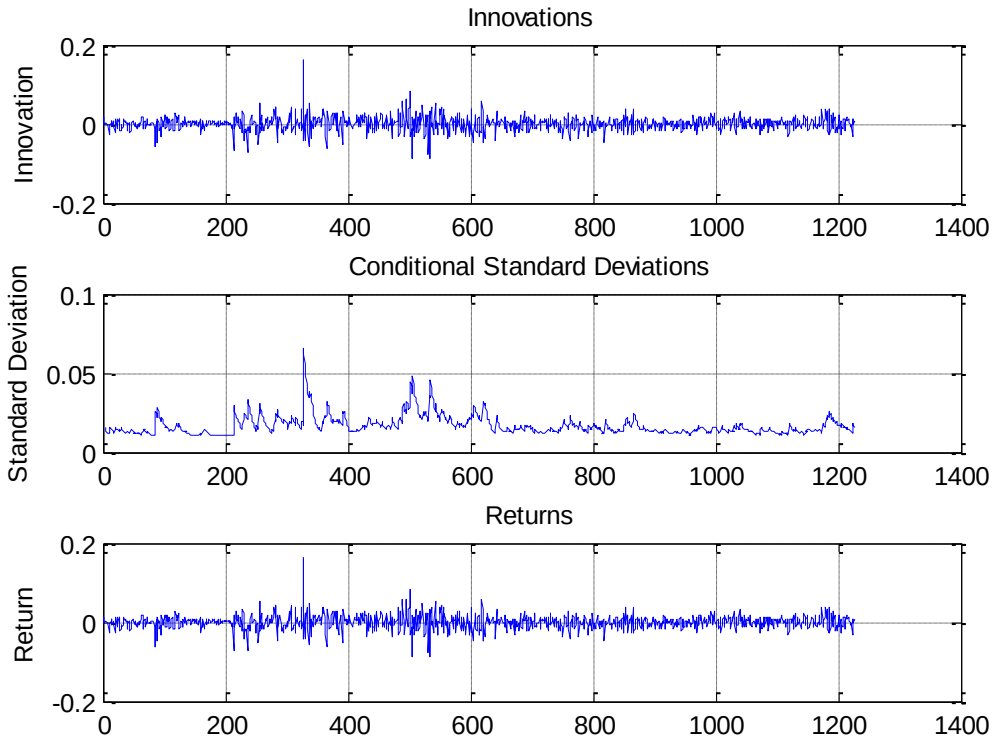
GARCH Comparison	
H	0
P	0.1482

Air China	Air China D



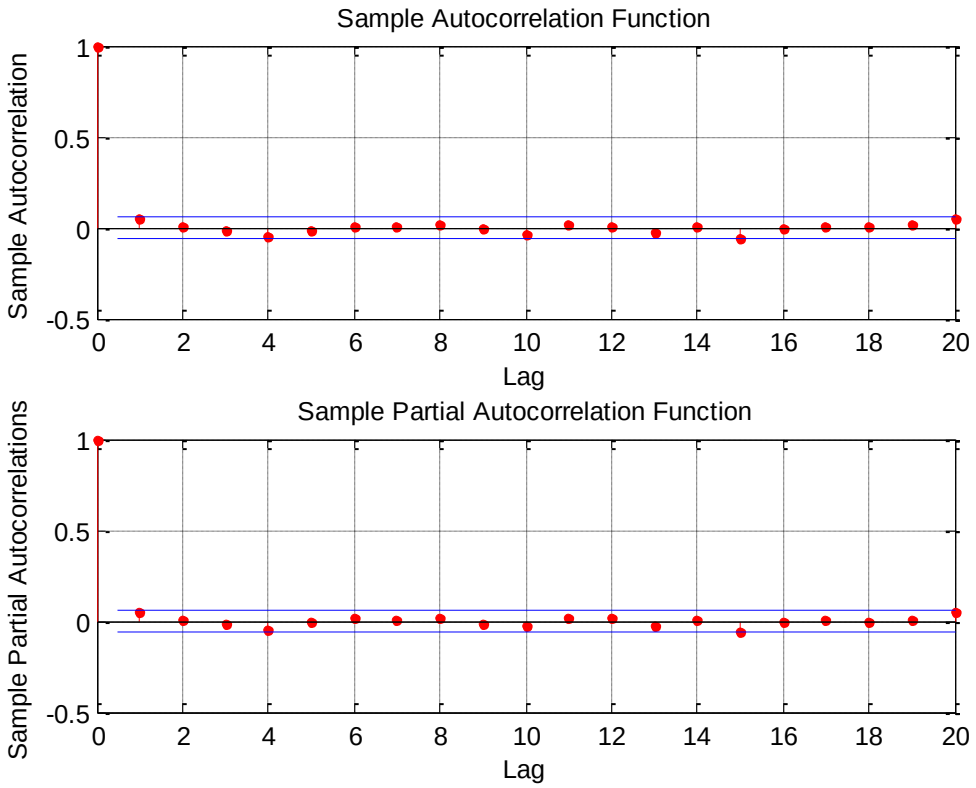
ARCH Test	
H	1
P	1.3983e-005
Fstat	58.0950
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00040848	0.00045829	-0.8913
K	1.8685e-005	2.5454e-006	7.3405
GARCH(1)	0.79764	0.025071	31.8151
ARCH(1)	0.1499	0.020441	7.3334
Log Likelihood value	3336.2		



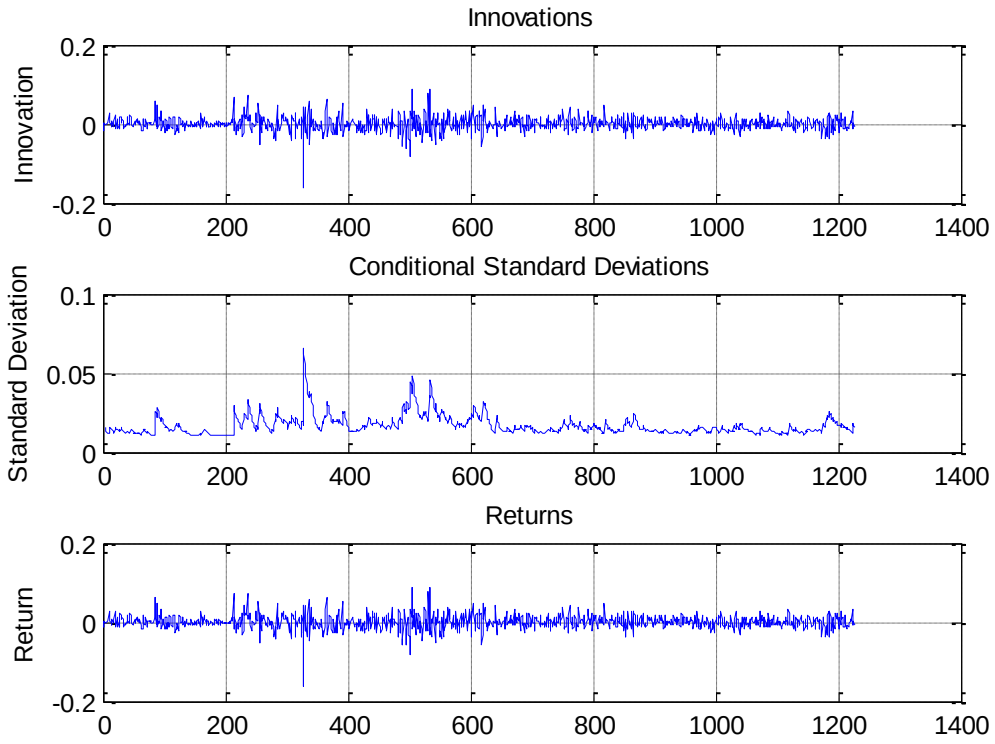
GARCH Comparison	
H	0
P	1

Air China	Air China H



ARCH Test	
H	1
P	1.4068e-005
Fstat	58.0778
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00042543	0.00045829	0.9283
K	1.8759e-005	2.5552e-006	7.3415
GARCH(1)	0.7971	0.02512	31.7318
ARCH(1)	0.15025	0.02047	7.3399
Log Likelihood value	3336.09		



GARCH Comparison	
H	0
P	1

Discussion

The airline sector was selected for a case study because it presents qualitatively interesting characteristics. For instance, it is easy to model for stock analysts (business model is relatively simple) and hence it would seem logical to assume that analyst's equity valuation forecasts should be relatively accurate. As previously mentioned the transportation sector is a strategically important one.

The results seem to indicate that a GARCH(1,1) is an appropriate model for A-H spread for Airlines. The test carried out indicates (for all the three airlines studied) that the GARCH(2,1) model is not superior to the GARCH(1,1) model. For the A-share and H-share log returns the results are a bit less clear. For Air China and China Southern a GARCH(1,1) model is appropriate for both A-share and H-share returns. On the other hand China Eastern seems to need a GARCH(2,1) model for the A-share and H-share return. This is interesting because it would be reasonable to assume that comparable companies, such as China Southern and

China Eastern Airlines, should be modeled appropriately with the same model but that seems not to be the case.

6.7 Chapter Conclusions

An ARCH test of all the dual A-H listed companies was performed. According to the results the vast majority of the companies (A-share, H-share and spreads) present ARCH effects. To the best of our knowledge there is no article in the literature analyzing every single dual listed (A-H) stock. A GARCH modeling of all the dual listed stocks was also performed. According to the results of our analysis, the GARCH(1,1) is not inferior to the GARCH(2,1) model for the majority of the companies analyzed.

A case study in the airlines sector was also performed. Interestingly the results indicate that the fact that two companies are comparable (for instance two airlines with similar size, business model and operations) is not enough reason for assuming that a GARCH model that works well for one of those companies (for instance company A) will work properly for the comparable company (company B). China Eastern Airlines and China Southern Airlines were analyzed in a case study. These two companies are, arguably, good comparable. Both airlines are mainly domestic airlines catering for roughly the same type of average traveler. The other big player in the China market is Air China but this company is a bit different from the other two (that's why the comparison is between China Southern Airlines and China Eastern Airlines). According to the results a GARCH(1,1) model is, similar to most other companies, a good model for China Southern (at least no worse than a GARCH(2,1) model). On the other hand, China Eastern seems to need a GARCH(2,1) model (according to the results a GARCH(2,1) model is a more appropriate one for this company than a GARCH(1,1) model).

Chapter 7. Conclusions

Chinese dual listed stocks were analyzed in depth in this dissertation. In the first part of the dissertation it is shown how a large amount of factors such as different regulatory system, trading hours, trading rules (such as short-sale bans and limit prices), holidays, language and investor base could cause price differences between the dual listed stocks in the Hong Kong market and mainland market. In the second part of the dissertation a very extensive quantitative analysis of dual listed Chinese stocks was performed. The characteristics of both the mainland market and the Hong Kong market were analyzed in depth reaching several conclusions. For instance, while it seems that there are features such as a large proportion of retail investors or a relatively less robust legal system in the mainland market, it seems that these factors per se cannot (in every given long period of time) cause a bigger volatility in the A-share market. Many studies have shown that in several periods (for instance from 2006 to 2009) the A-share market was indeed more volatile than the H-share one. Another results obtained in this analysis is that the introduction of the QFII and RQFII pilots seem not to have had a significant impact on the A-H spreads of the analyzed dual listed companies. This is consistent with the fact that these pilots are small compared to the overall size of the market. It should be noted that these programs were introduced gradually, granting quotas to a few investors and slowly increasing the amount of investors over time. This gradual approach makes analyzing the impact on the overall market very challenging. Given the importance of retail investors in the mainland market an analysis of some of their main relevant characteristics was made. A survey of Chinese investors was performed. According to this survey most of Chinese retail investors do not look at the performance of the H-share market when investing in the A-share market (dual listed). This relationship seems to hold across age, gender and location. A research on H-share investor base was also performed showing a very high concentration among institutional investors. Five international investors: Blackrock, JP Morgan, Vanguard, FMR and Government of Singapore Investments account for a substantial portion of the total market capitalization of dual listed H-share companies. Most of these investors tend to be buy and hold and hence it could potentially help decreasing volatility in this market. On the short side the two main players according to Bloomberg figures are Deustche Bank and Credit Suisse.

A large amount of statistical analysis was performed on Chinese stocks. The results seem to indicate that the returns of Chinese stocks (not only the dual listed subsector) do not to follow, in general, a normal distribution. Dual listed companies were analyzed in detail showing that while historically A-shares are more volatile than H-shares this relationship does not hold in every long period (at least at a company level). For instance, in the 12 months period analyzed (roughly matching the 2011 calendar year). This relationship did not hold and in fact H-share, in most cases, seemed more volatile in this period than its mainland counterparty. The results also indicate that over an extended period of time (12 months) there seems to be no statistical difference between the returns in the A-share market and H-share market for dual listed companies. The analysis also shows that there is no strong linear correlation between the returns in A-share and H-share market of dual listed stocks. This does not mean that there is no relation between these returns, just that this relation is not linear.

The analysis also shows that in roughly 65% of the cases analyzed the H-share market and the A-share market follow the same direction i.e., an increase (decrease) in the share price of Bank of China H-share is concurrent (daily basis) with an increase (decrease) in the share price of Bank of China A-share. It was shown through a case study that the common assumption that the A-share market will react to a market event in a more volatile way than the H-share market (dual listed companies) does not necessarily hold in every situation. Efficient frontiers were calculated for two portfolios, one formed by the A-shares (dual listed) and one formed by the H-shares (dual listed). The main conclusion of this analysis is that the efficient frontiers for those two portfolios look rather different.

It was also found that there seems to be two types of dual listed companies according to their behavior. One type is formed by the large state-owned banks (and related companies) and the second type is composed by all the other dual listed stocks. A Markov-switching model with two states, bullish and bearish, was performed in order to further quantify this division between these two types of dual listed stocks. The model seems to be successful at differentiating between them. The large state-owned banks (and related companies) have a regime with infinite expected duration, making a trading strategy on those names (based on A-H arbitrage) unlikely to succeed. The rest of companies (second type) have finite expected durations given more chances for an skillful investor to do a successful arbitrage. This result is consistent with the qualitative notion that these banks are very special companies. For

instance, their main objective is arguably not profit maximization but implementing the economic policies (formally or informally) of the authorities. Their ownership structure (by definition state-owned) clearly is also a factor affecting their trading performance. Finally, and perhaps more importantly, is the fact that these banks have the complete backing of the authorities making a bankruptcy or default extremely unlikely. They are considered as too big to fail by many market participants and it is expected that in the hypothetical case of running into issues they would be supported by the state.

In order to understand the impact of changes in the overall economy on dual listed companies stock a principal component analysis (PCA) was carried out. The variables analyzed were CPI, SHIBOR, M2, Gross output value of industry, Buildings started, consumer confidence, CPI food, export and import prices and PMI. The results are overall satisfactory. The results indicates that a four-factor models seems superior to a three-factor model (at least from the point of view of the stocks spread) while a five-factor model providing little advantage compared to a four-factor model for an average trader. Interestingly it was possible to interpret, to a certain degree, the four components obtained.

In last section of quantitative analysis further work is done on the volatility topic. Volatility is commonly identified in finance with risk and it is of crucial importance for market players. An ARCH test performed in all the dual listed companies showed the existence of ARCH effects. GARCH(P,Q) models were used to model volatility. GARCH(P,Q) models are frequently used in this case of situation because they take into account clustering effects. Clustering effects are commonly observed by traders in the market. For instance if due to some type of event the volatility of the market is very high today it is likely that volatility is also high tomorrow. GARCH models seem to work well for Chinese dual listed companies. A comparison of a GARCH(1,1) and a GARCH(2,1) for all the dual listed companies was performed. The results indicate that the GARCH(2,1) is for the vast majority of stocks not a better model than the GARCH(1,1). The GARCH model was used not only for A- H stock spread but also for the log returns of A-shares and H-shares (dual listed). It was shown through a case study in the airline sector that it is not possible to conclude that similar companies will be necessarily well defined by the same model (for instance GARCH(1,1) or GARCH(2,1)) and it seems necessary to do a model comparison on a case by case basis. It should be noted once more that the GARCH(1,1) was superior for the vast majority of stocks

analyzed.

Further work

One of the intrinsic limitations of this analysis, and any other analysis on dual listed companies in the mainland and in Hong Kong, is the limited amount of data available as the track record of dual listed stocks is relatively short. China is currently experiencing a deep transformation passing from an exports driven economy to a consumption economy and reforming its institutions to have a more efficient economy and a more sustainable economic growth. A significant amount of those changes are expected to be in place in the next five years and it will be interesting to revisit the conclusions of this article at that time.

Another topic that could be further developed is the analysis of A-B dual listed companies. This work focus on A-H dual listed companies as this market is a bigger and more dynamic that the A-B sector (there have been no new IPOs in the B-share market for a long period of time and there are no indications of future IPOs). Nevertheless, this is an existing market and could be interesting comparing results (between A-B and A-H dual listed companies).

Another interesting area that deserves further work is the retail investors understanding of the stock market and their preferences. Some analysis was performed in this respect but the topic is so large that clearly deserves a separate article. Retail investors account for a very sizeable portion of the market in China and at the same time are also the end consumers of many of the listed companies' analyzed in this study. Hence, having a deep understanding of their behavior would clearly be an advantage for investors.

Appendix 1 - Companies Analyzed

Companies analyzed	
Air China	Hudian Power
Aluminum of China	Industrial & Commercial Bank of china
Angang Steel	Jiangsu Expressway
Anhui Conch	Jiangxi Copper
Anhui highway	Jinwei Textile
Bank of China	Luoyang Glass
Bank of Communications	Maaanshan Iron& Steel
Beijing north star	Northeast Electric Development
Beiren Printing Machines	PetroChina
China Coal Energy	PingAn
China Eastern Airlines	Shandong Chenming Paper
China Life	Shandong Pharmaceutical
China Merchants	Shenji Group
China Oilfield	Shenzhen Expressway
China Petroleum	Sinopec Shanghai Petrochemical
China Railway	Sinopec Yizheng Fibre
China Shenhua	Tianjin Capital
China Shipping container	Tsingtao Brewery
China Shipping Development	WeiChai Power
CITIC	Yanzhou mining
Datang International	Zijin Mining Group
Dongfang International	ZTE corporation
Guangsheng International	China Construction Bank
Guangzhou Pharma	China Cosco
Hisense	
Huaneng	

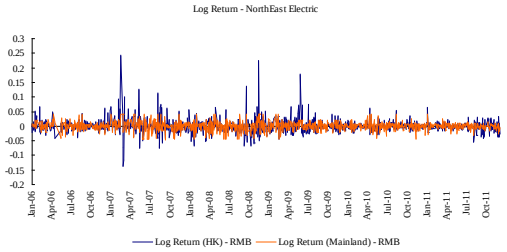
Appendix 2 – Betas

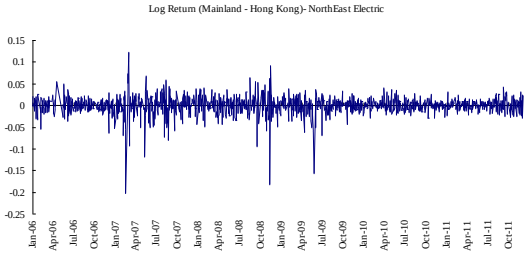
Beta		
Company	**Mainland China**	**Hong Kong**
Air China	1.30	1.22
Aluminium of China	1.22	1.46
Angang Steel	0.78	1.52
Anhui Conch Cement	1.22	1.47
Anhui Expressway	1.00	0.94
Bank of China	0.74	1.12
Bank of Communications	0.94	1.22
Beijing North Star	0.94	1.09
Beiren Printing Machinery	0.74	0.55
China Coal Energy	1.23	1.37
China Construction Bank	0.78	1.14
China COSCO	1.24	1.35
China Eastern Airlines	1.22	1.11
China Life	1.00	1.08
China Merchants Bank	1.00	1.42
China Oilfield Service	1.15	1.28
China Petroleum and Chemical	0.94	0.86
China Railway Group	1.02	1.59
China Shenhua Energy	1.11	1.09
China Shipping Container	1.22	1.38
China Shipping Development	1.31	1.32
China Southern Airlines	1.36	1.18
Chongqing Iron & Stee;	0.96	1.29
Datang International Power	0.80	0.82
Dongfang Electric Corporation	1.11	1.25
Guangshen Railway	0.80	0.86
Guanzhou Shipyard	1.22	1.38
Hisense Kelon Electrical	0.90	1.19
Huadian Power International	0.89	0.84
Huaneng Power International	0.71	0.65
ICBC Bank	0.79	1.26
Jiangsu Expressway	0.80	0.74
Jiangxi Copper	1.63	1.68
Jingwei Textile Machinery	1.15	1.16
Luoyang Glass	0.87	1.08
Maanshan Iron & Steel	1.00	1.44
Nanjing Panda Electronic	1.13	0.90
Northeast Electric Development	1.00	1.12
PetroChina	0.78	1.03
Ping An Insurance	1.10	1.35
Shandong Chenming PaPer	0.81	1.15
Shandong Xinhua Pharmaceutical	1.06	0.73
Shenji Group Kunming Machine	1.21	1.16
Shenzhen Expressway	0.90	0.92
Sinopec Shanghai Petrochemical	0.91	1.06
Sinopec Yizheng Chemical Fibre	1.01	1.40
Tianjin Capital	1.13	0.98
Tsingtao Brewery	0.61	0.71
Weichai Power	0.94	1.41
Yanzhou Mining	1.56	1.36
Zijin Mining Group	1.44	1.42
ZTE Corporation	0.91	0.88

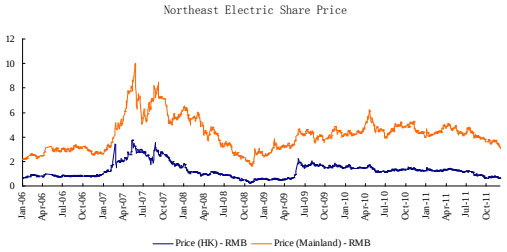
Source: Bloomberg

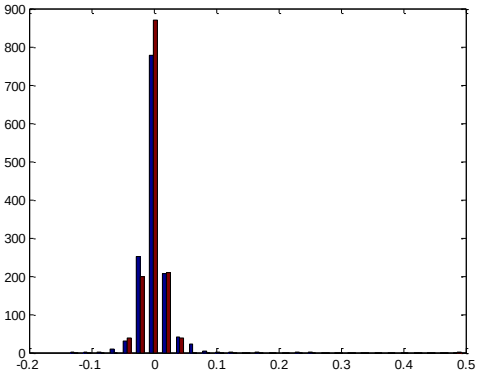
Appendix 3 – Returns, log returns and histograms

Northeast Electric

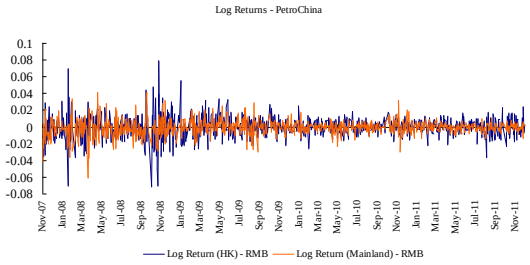


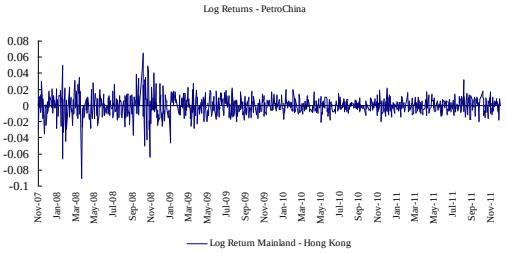


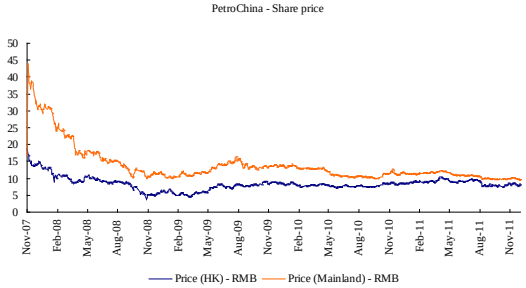


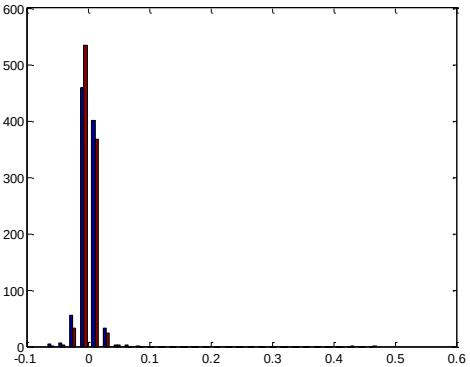


PetroChina

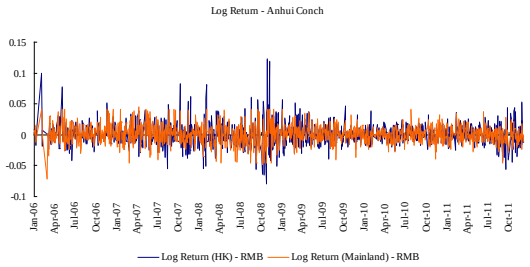


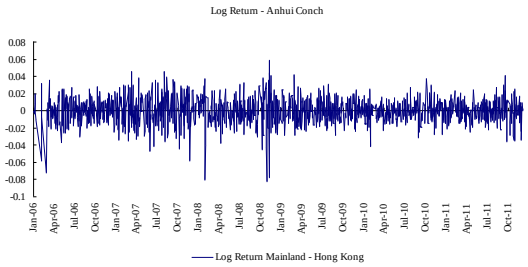


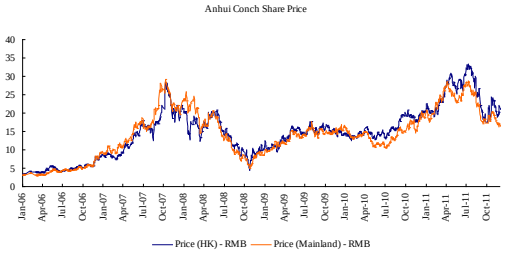


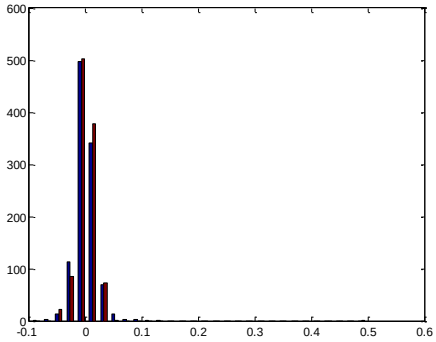


Anhui Conch

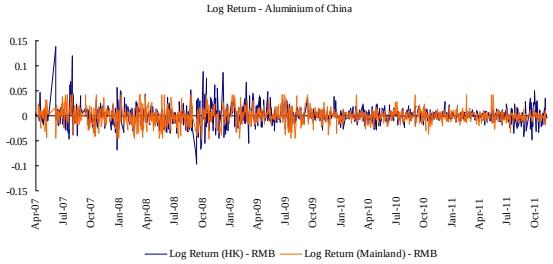


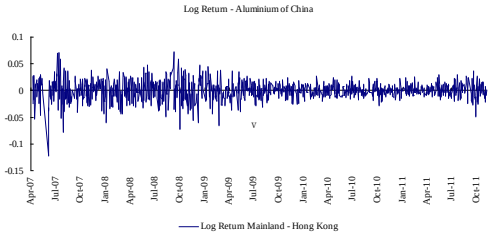


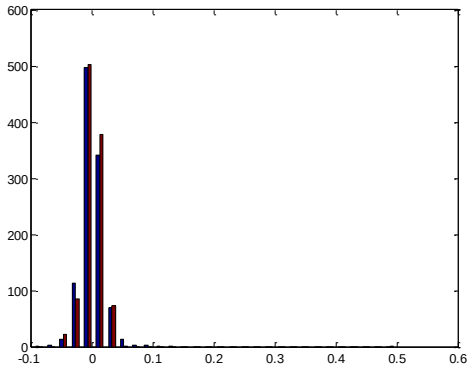




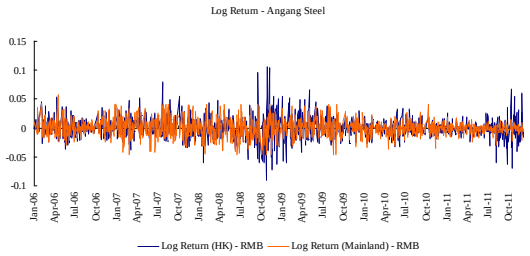
Aluminum of China

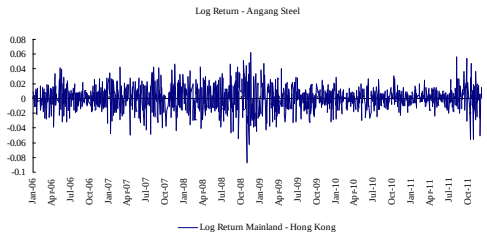


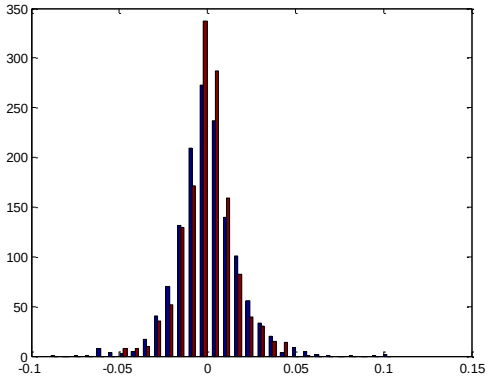




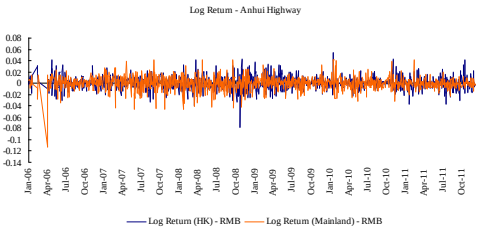
Angang Steel

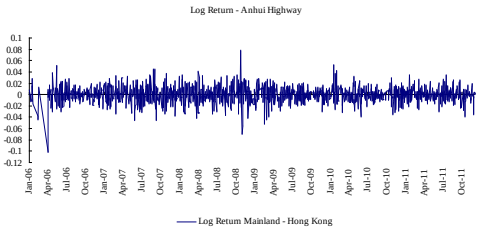


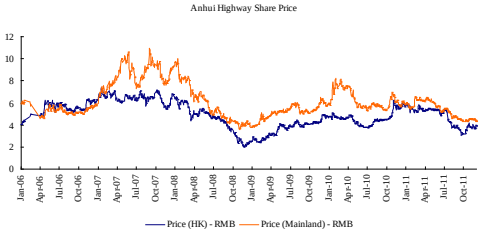


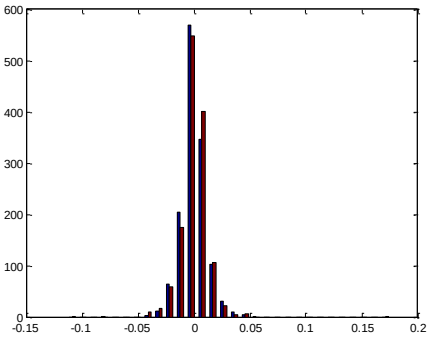


Anhui Highway

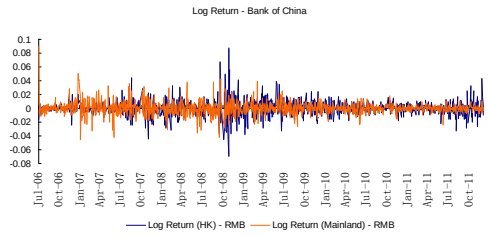


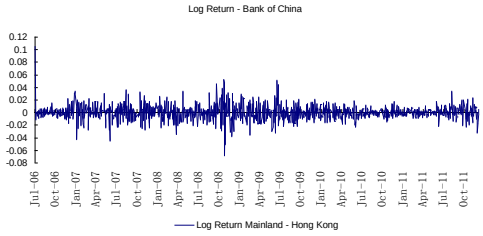


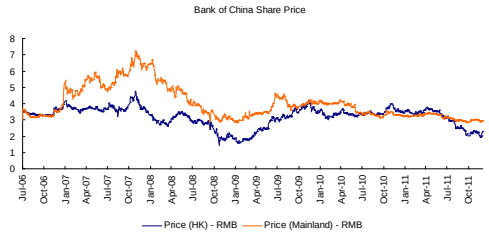


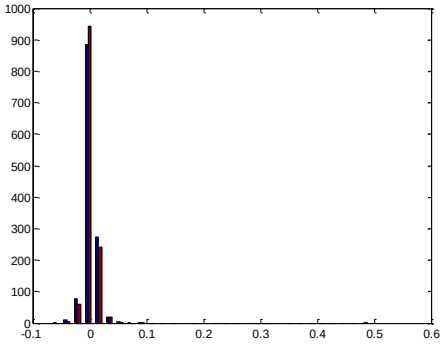


Bank of China

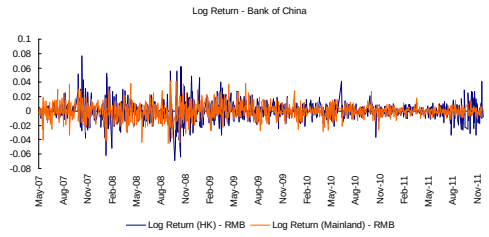


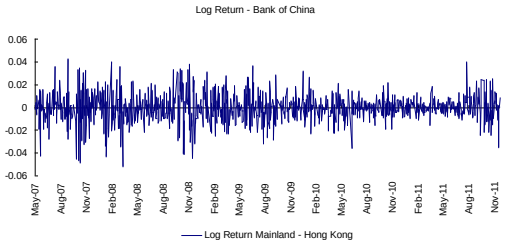


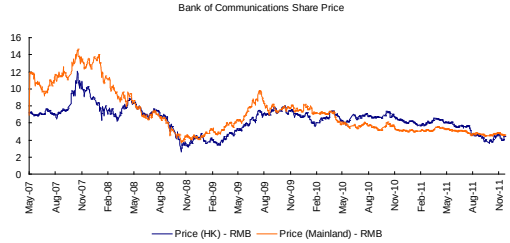


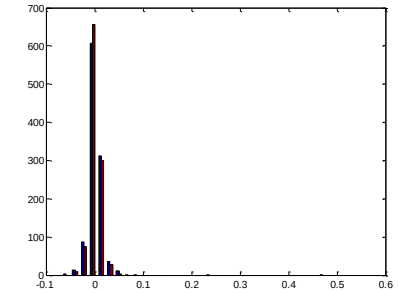


Bank of Communications

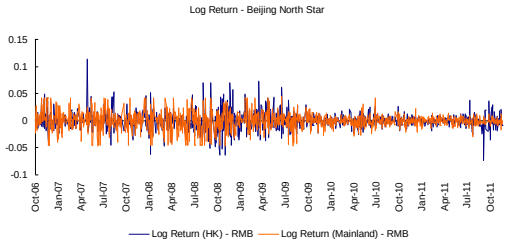


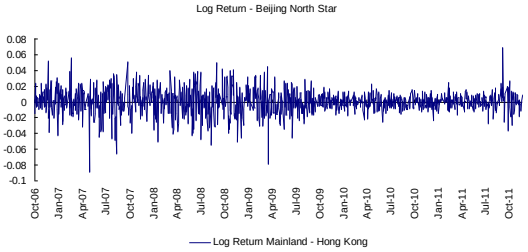


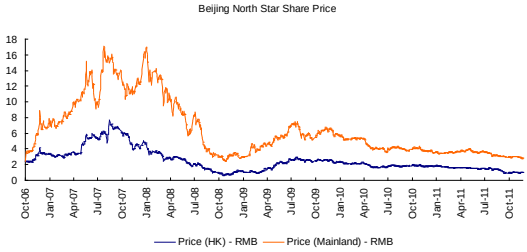


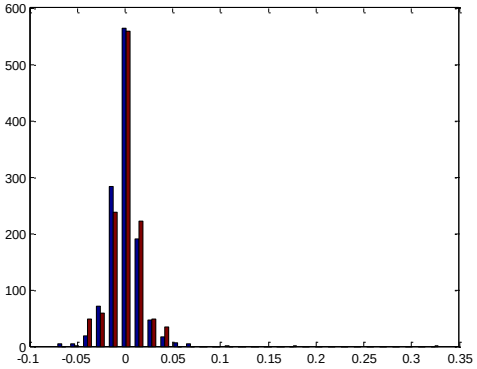


Beijing North Star

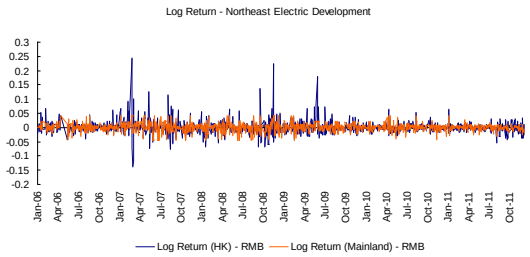


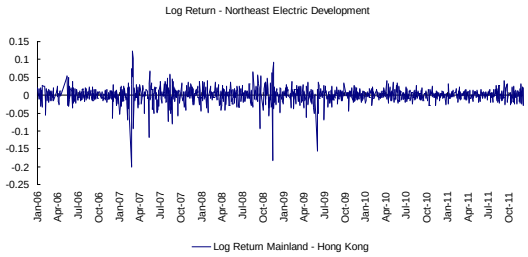


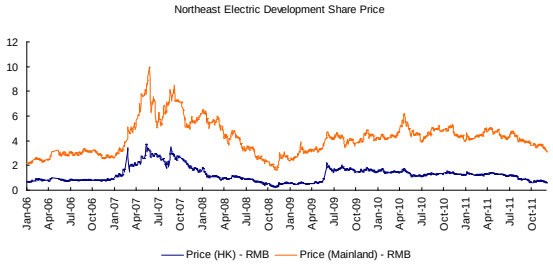


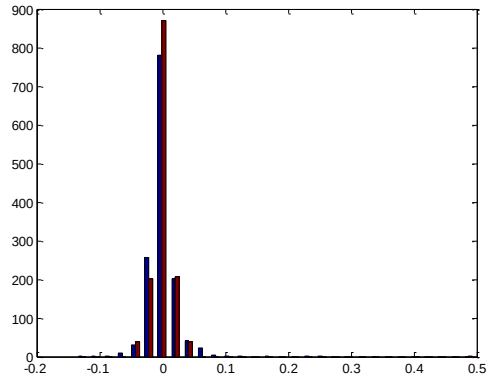


Northeast Electric Development

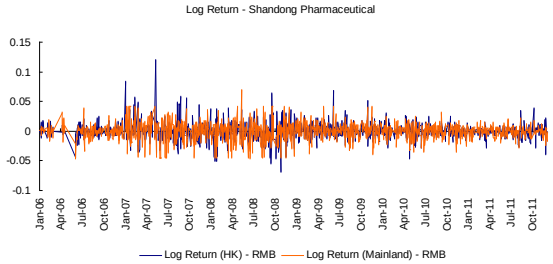


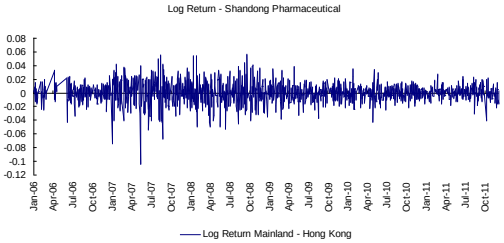


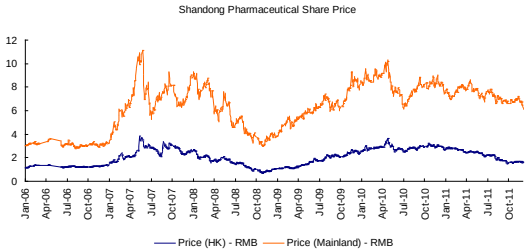


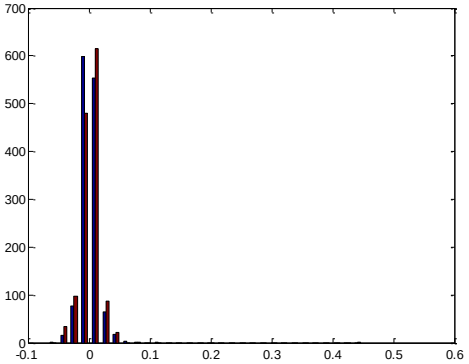


Shandong Pharmaceutical

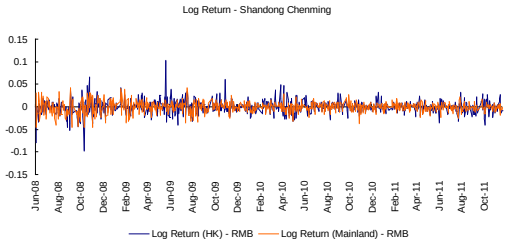


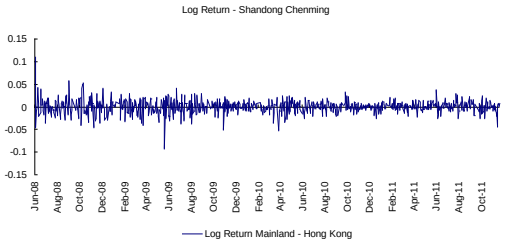


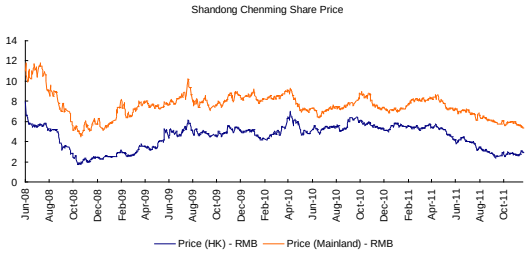


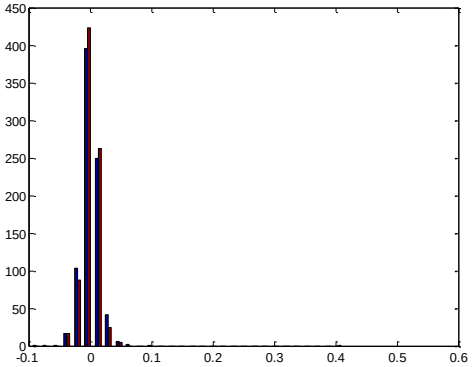


Shandong Chenming Group

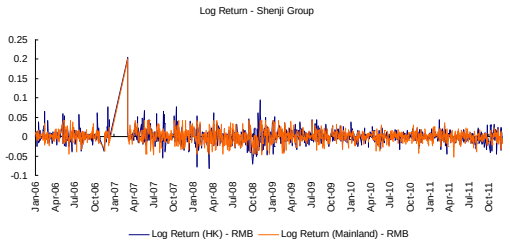


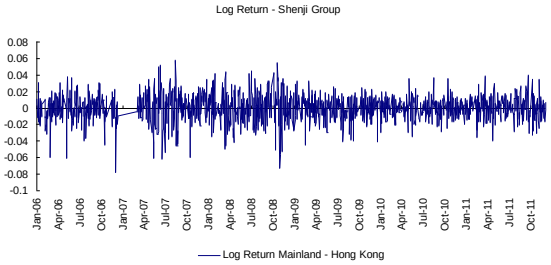


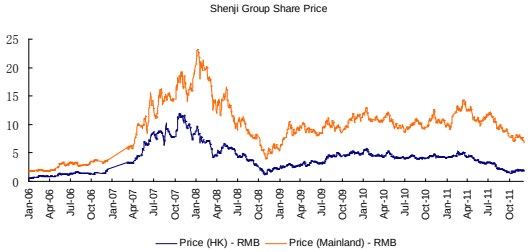


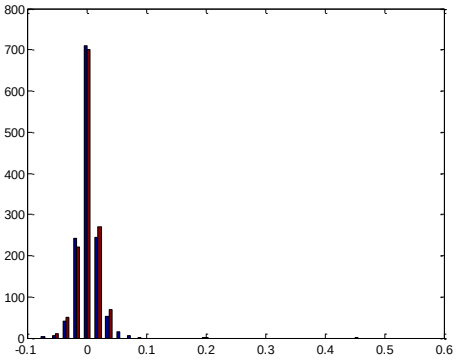


Shenji group

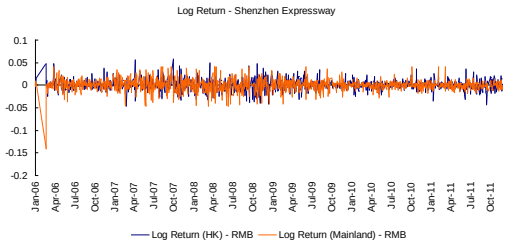


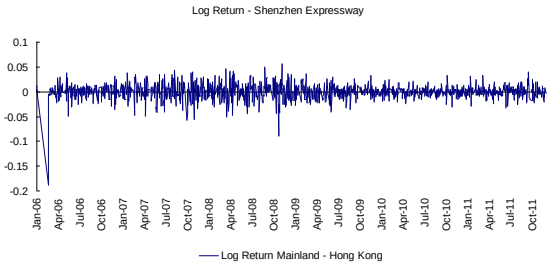


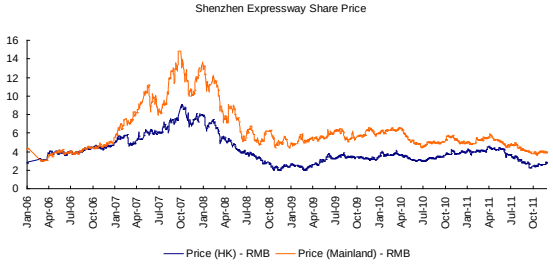


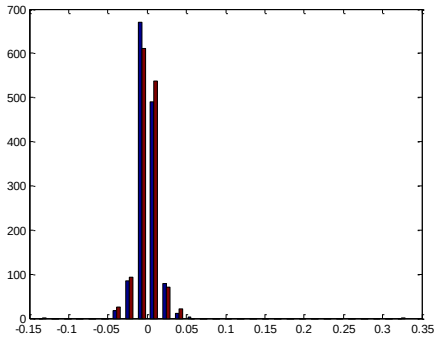


Shenzhen Expressway

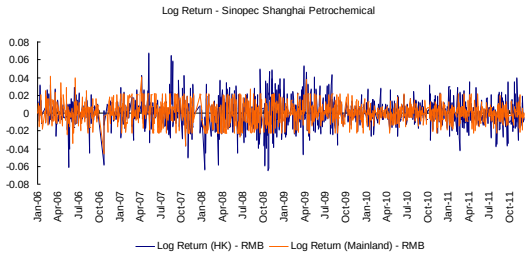


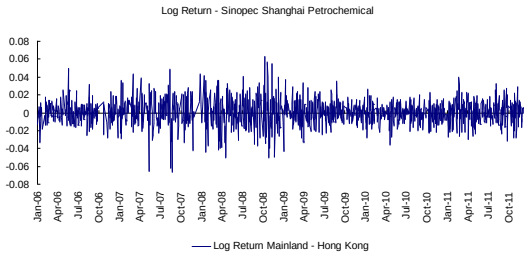


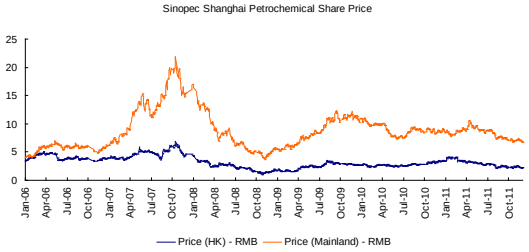


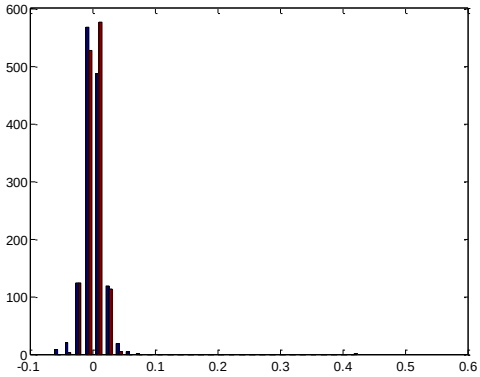


Sinopec Shanghai Petrochemical

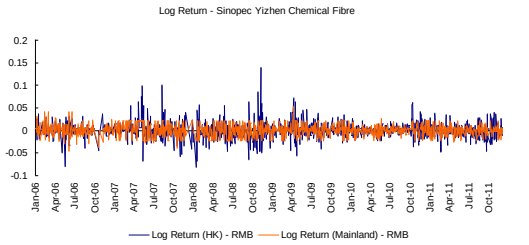


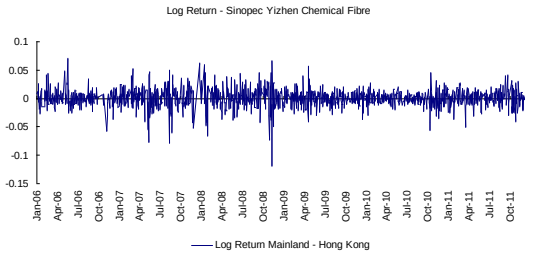


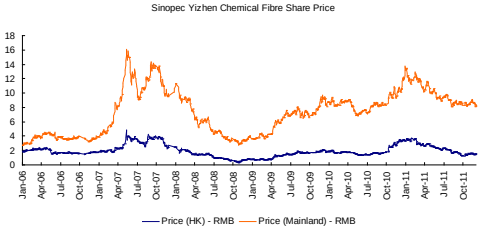


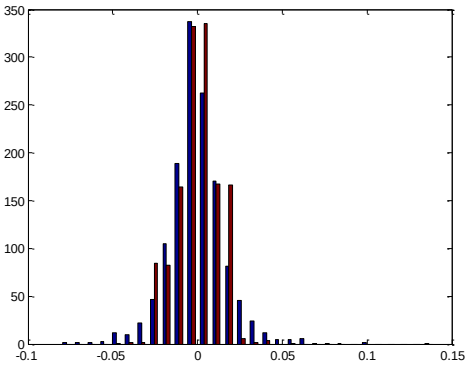


Sinopec Yizheng Chemical Fiber

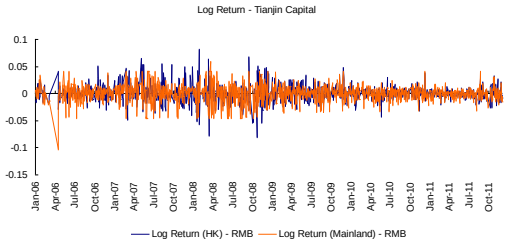


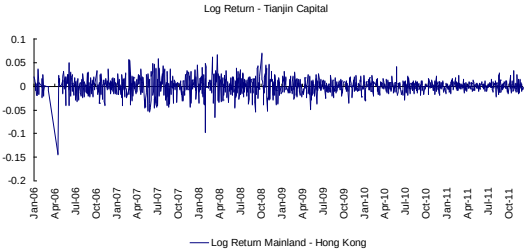


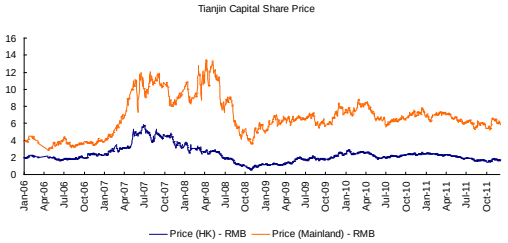


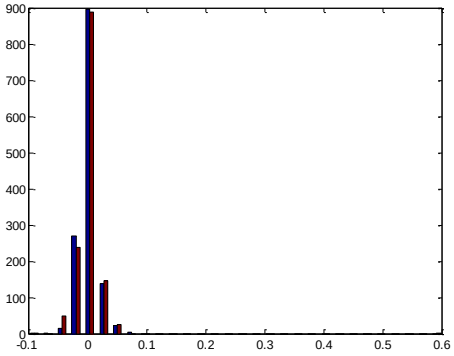


Tianjin Capital

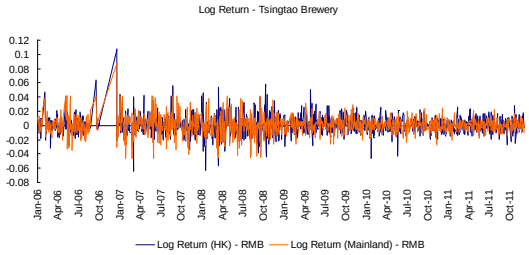


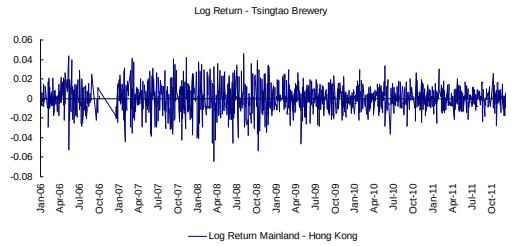


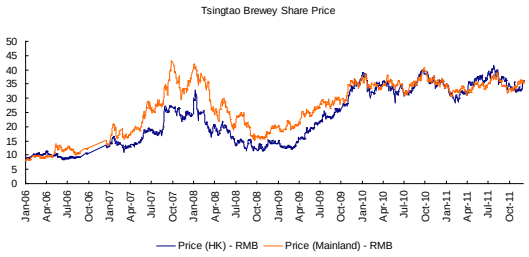


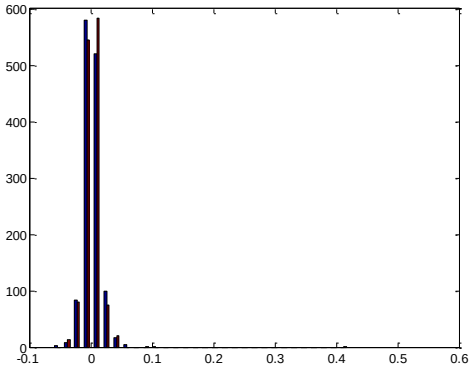


Tsingtao Brewery

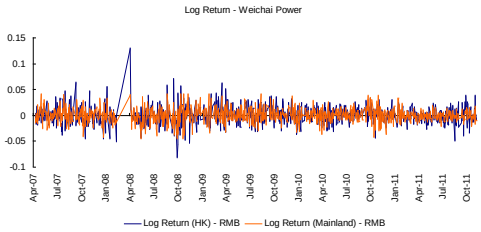


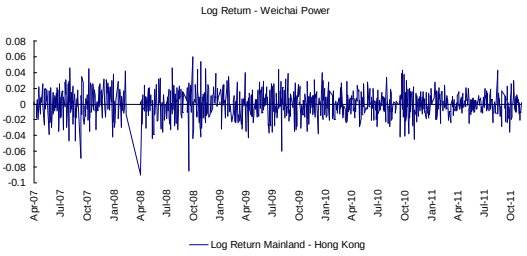


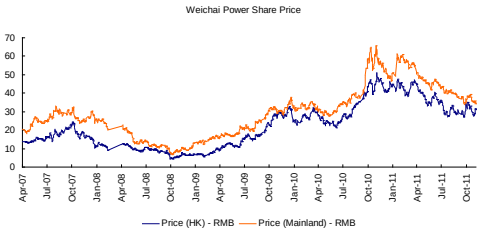


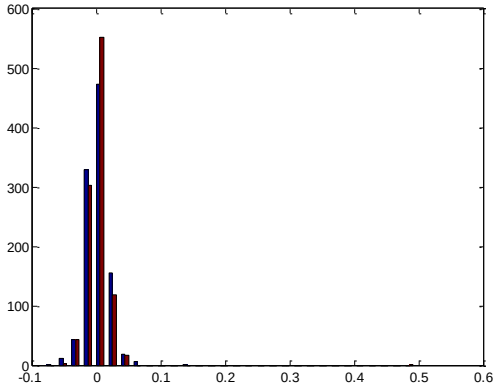


Weichai Power

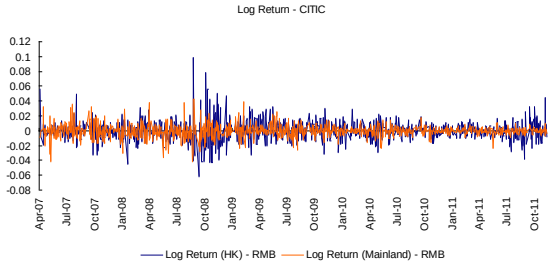


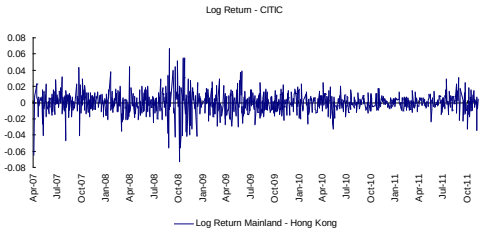


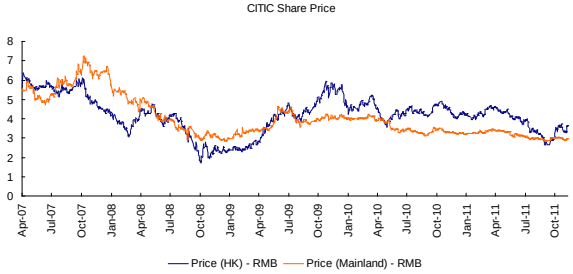


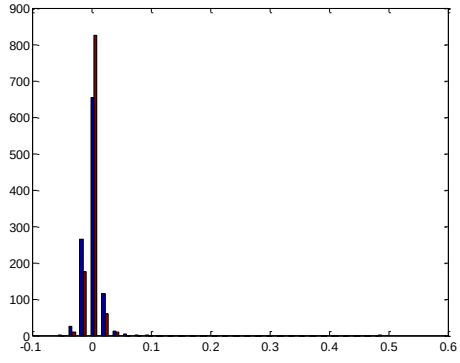


CITIC

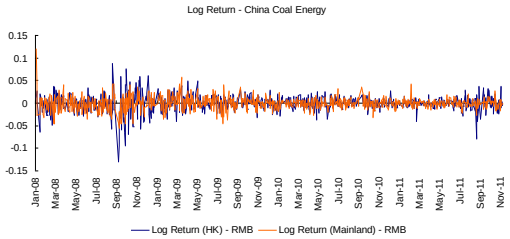


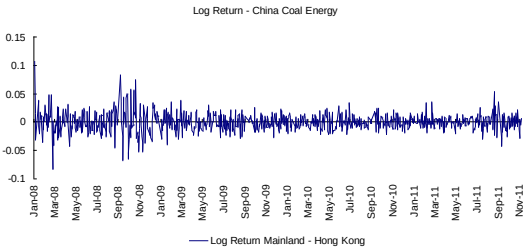


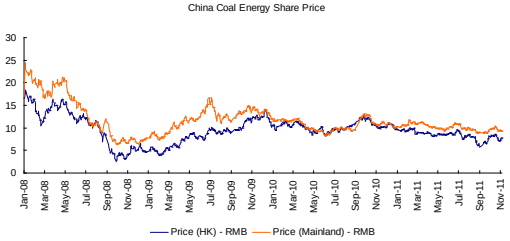


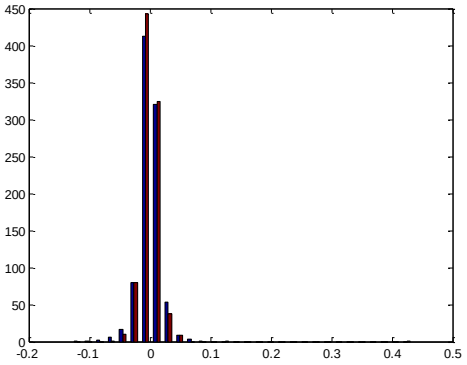


China Coal Energy

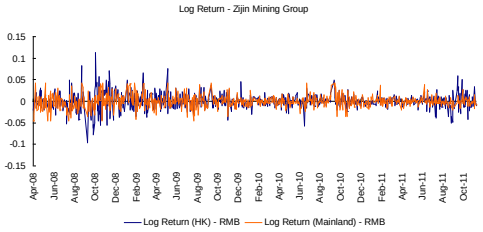


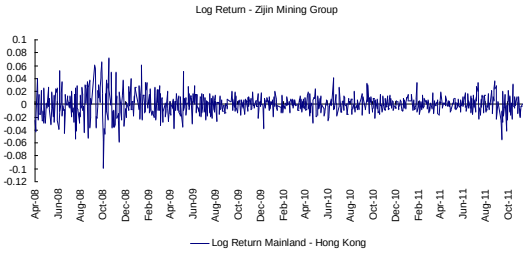


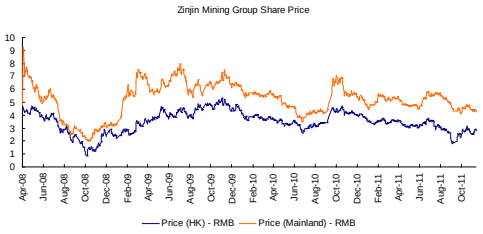


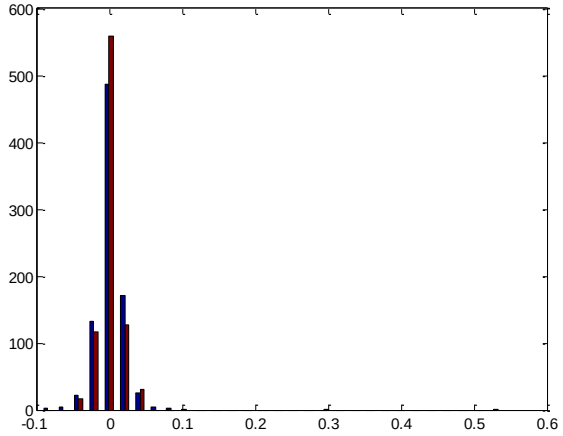


Zijin Mining Group

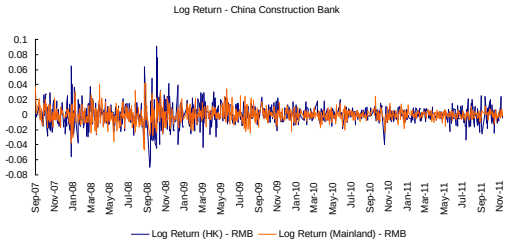


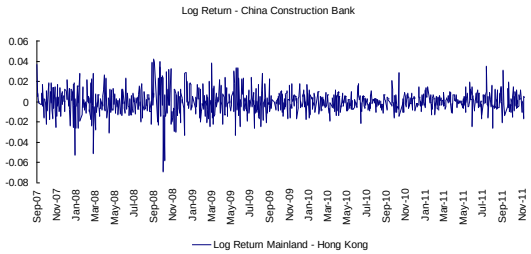


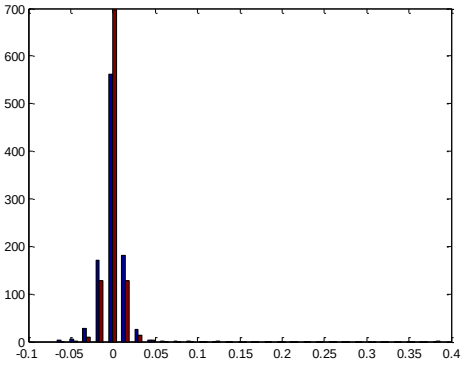




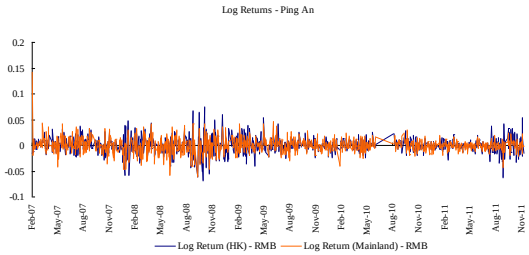
China Construction Bank

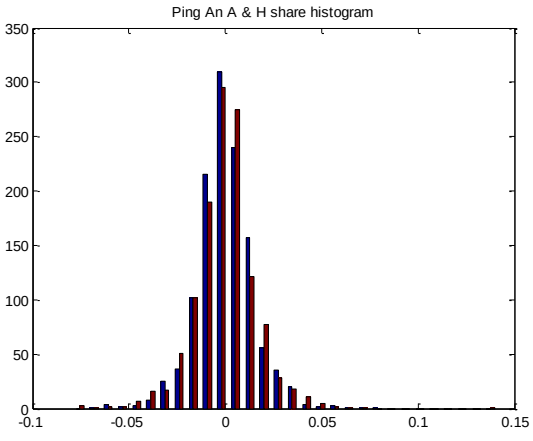


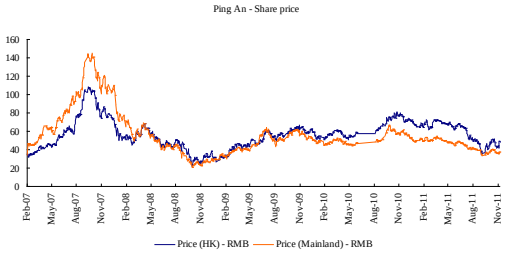




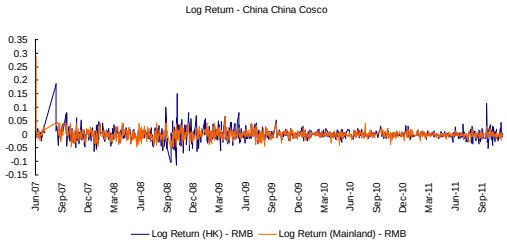
Pin An Insurance

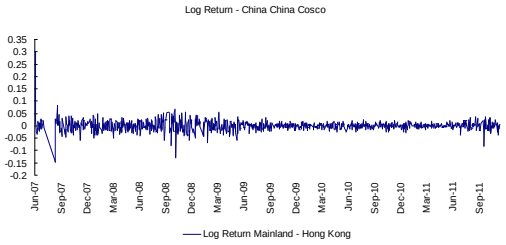


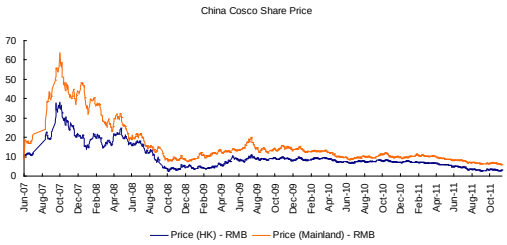


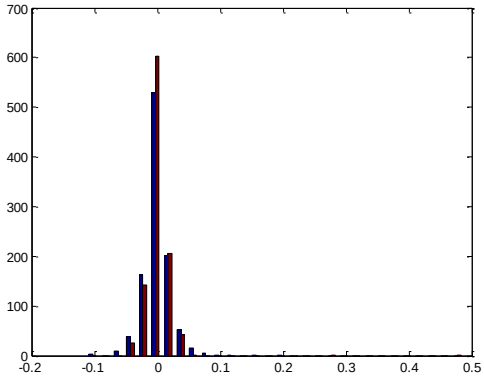


China COSCO

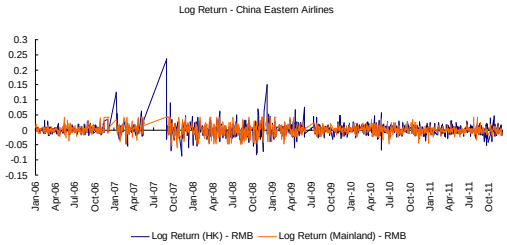


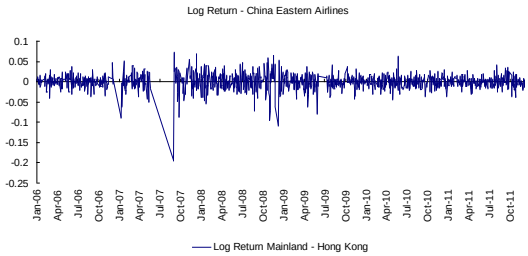


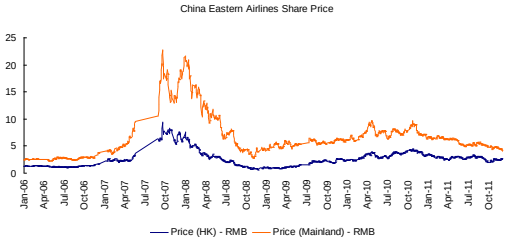


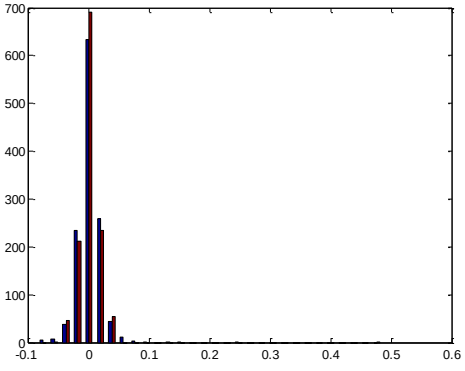


China Eastern Airlines

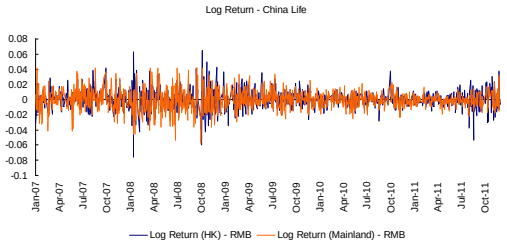


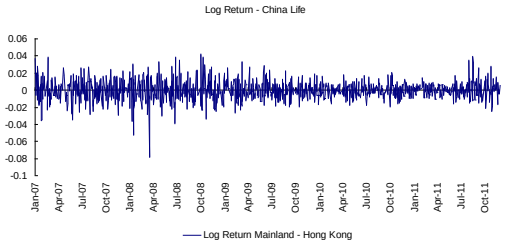


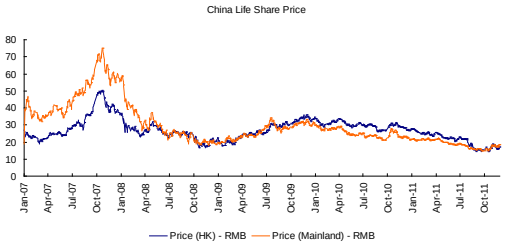




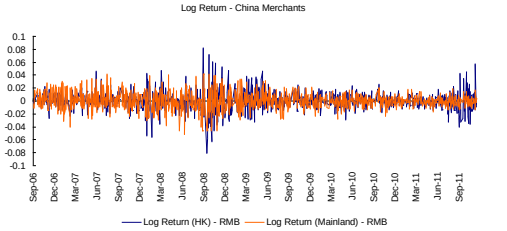
China Life

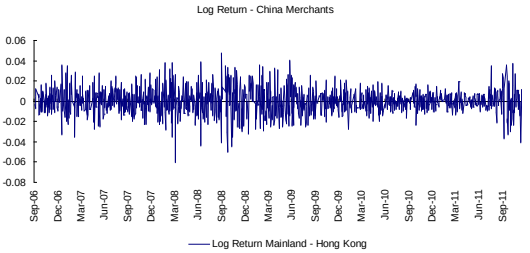


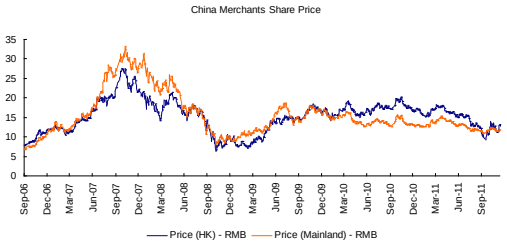


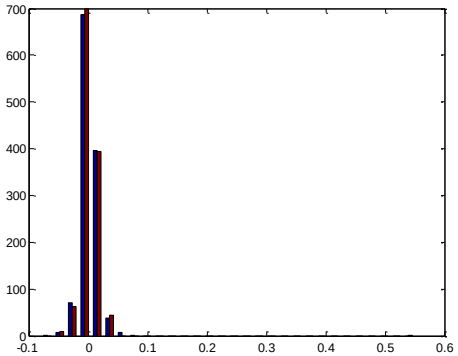


China Merchants

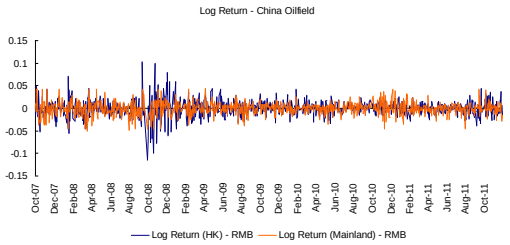


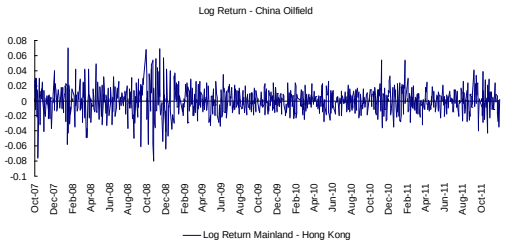


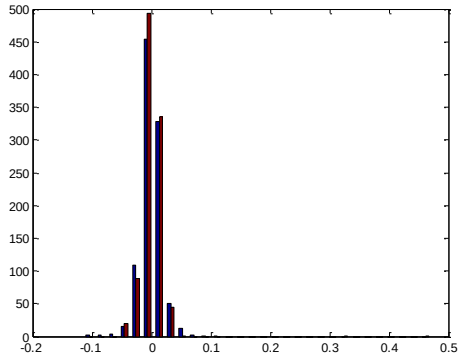




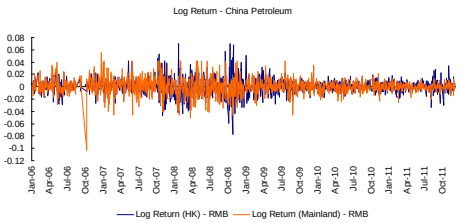
China Oilfield

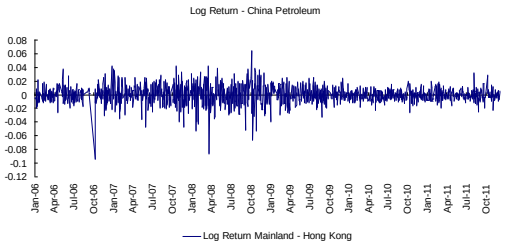


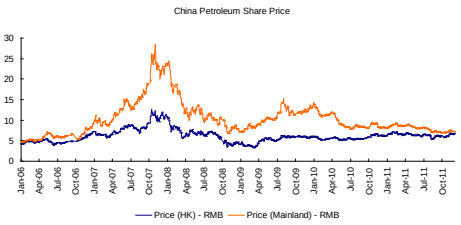


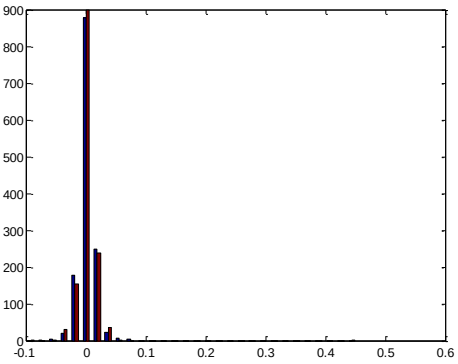


China Petroleum

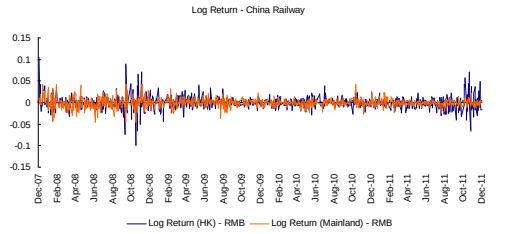


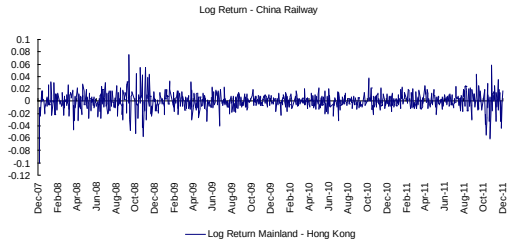


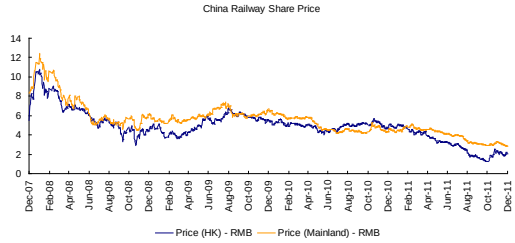


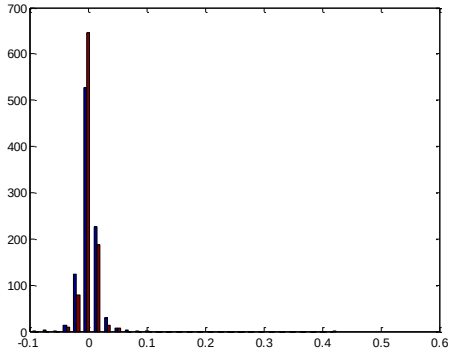


China Railway

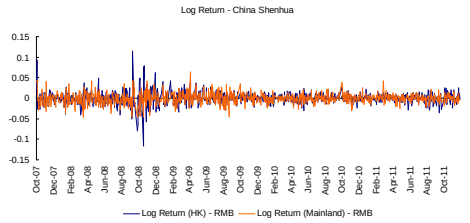


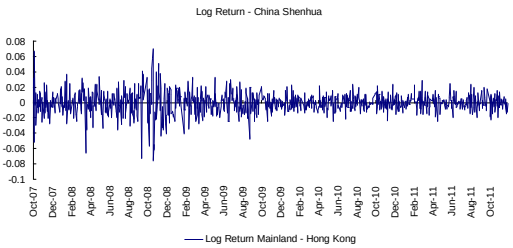


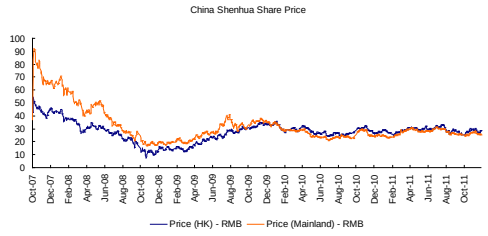


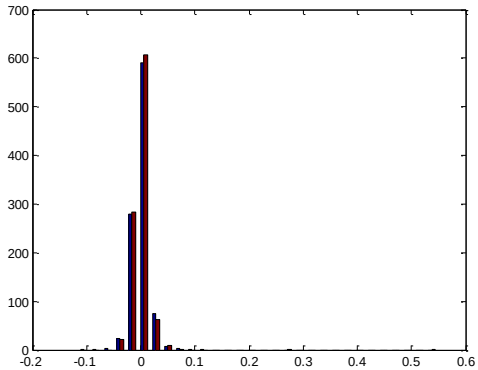


China Shenhua

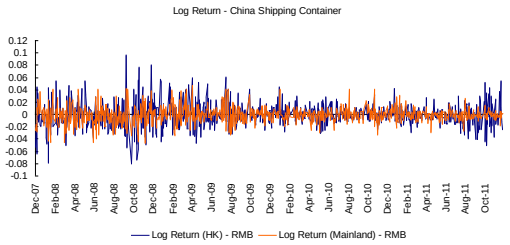


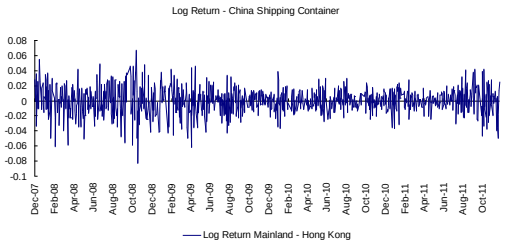


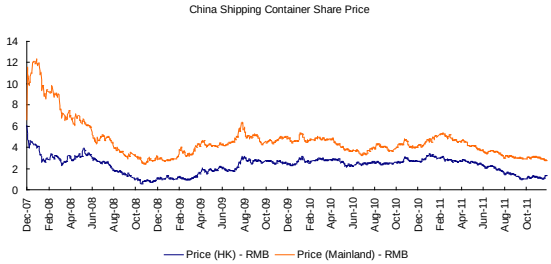


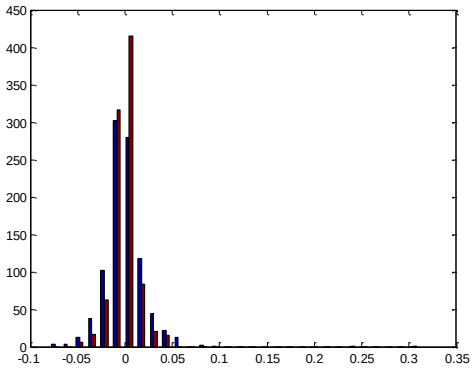


China Shipping Container

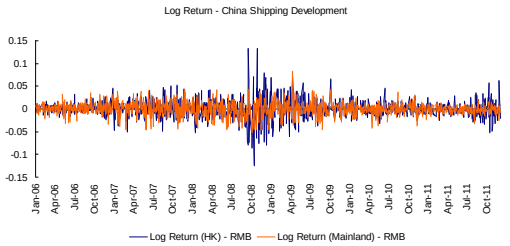


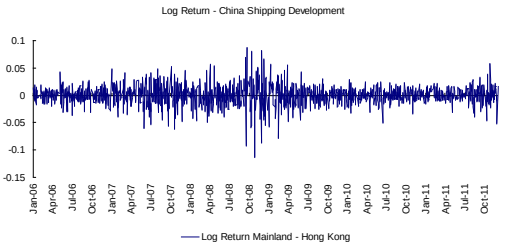




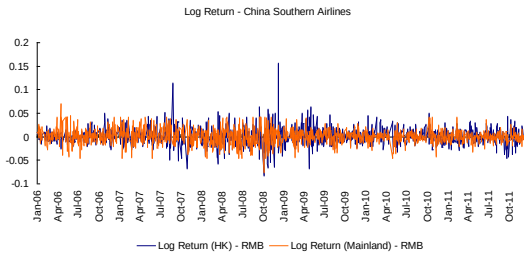


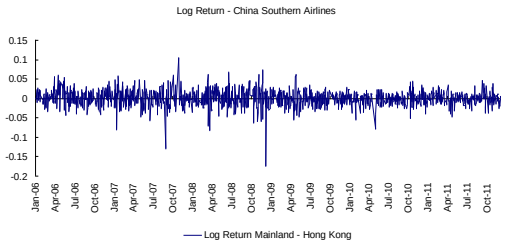
China Shipping Development

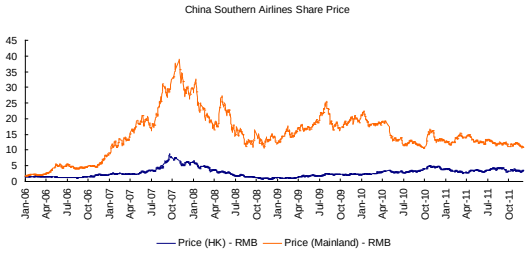


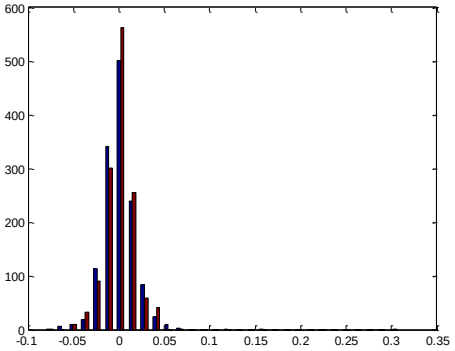


China Southern Airlines

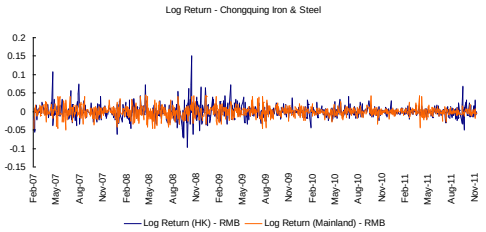


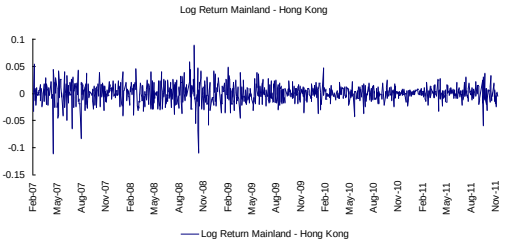


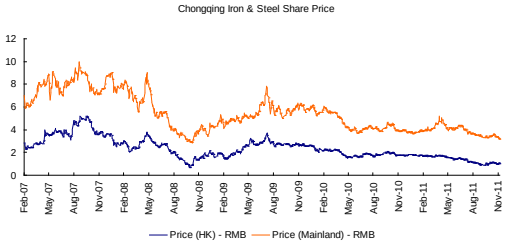


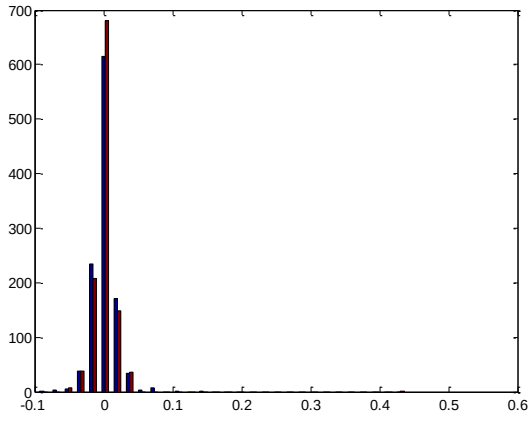


Chongqing Iron & Steel

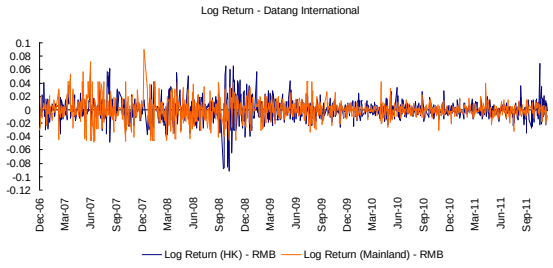


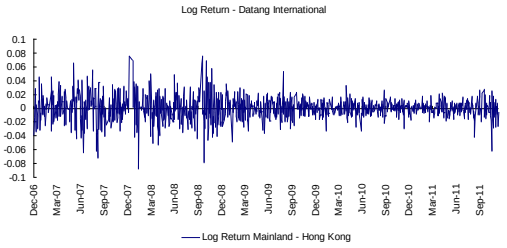


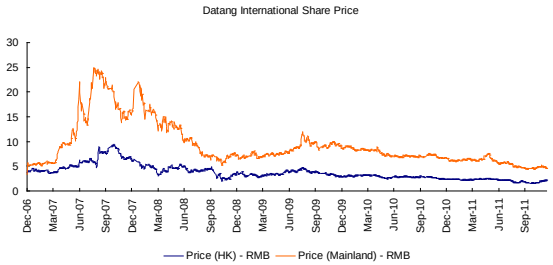


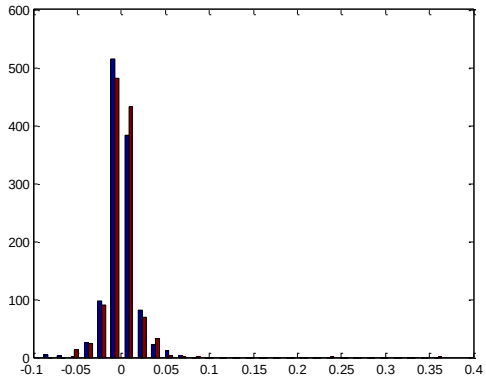


Datang International

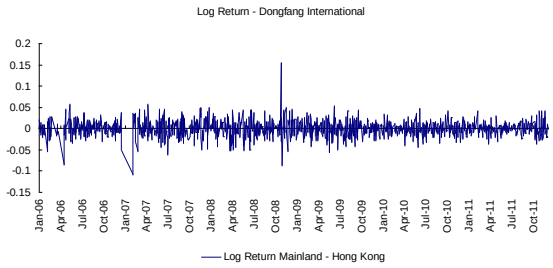


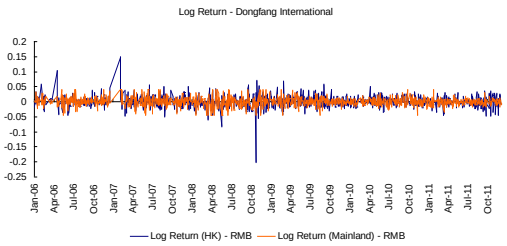


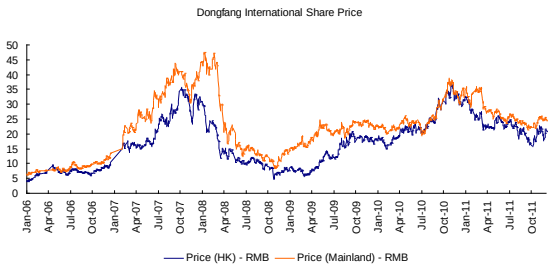


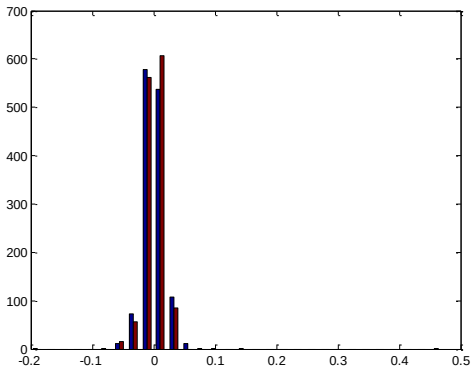


Dongfang International

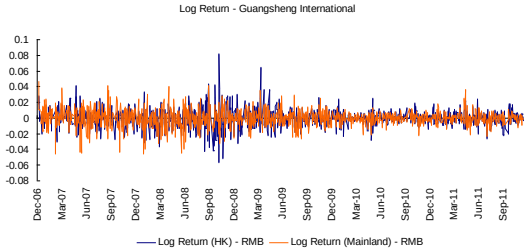


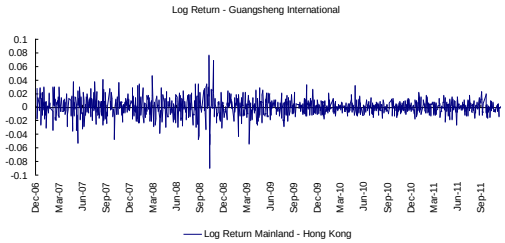


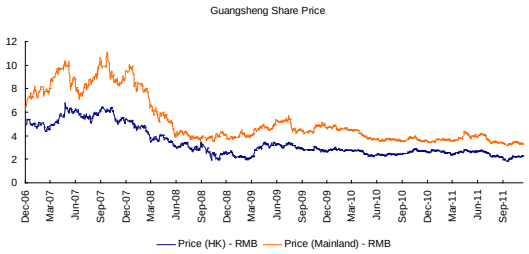


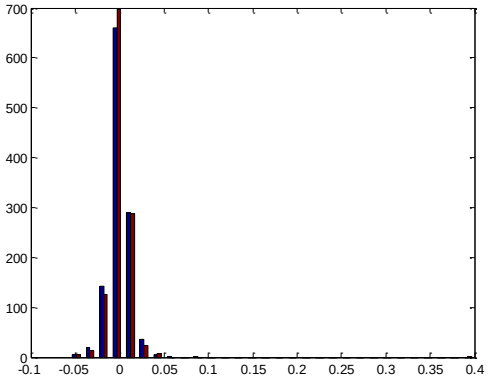


Guansheng International

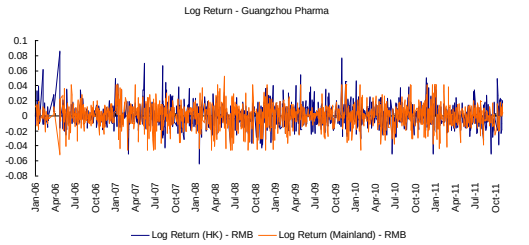


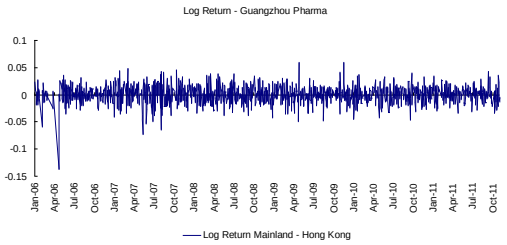


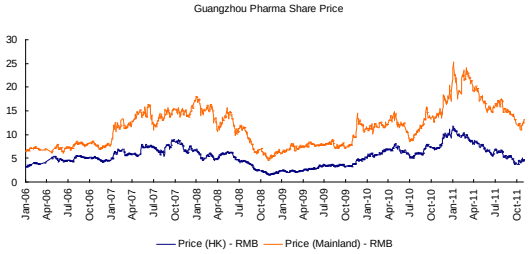


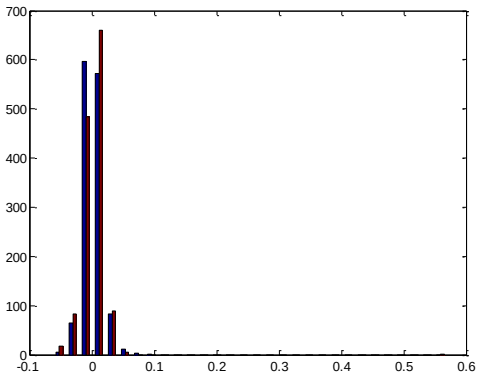


Guangzhou Pharma

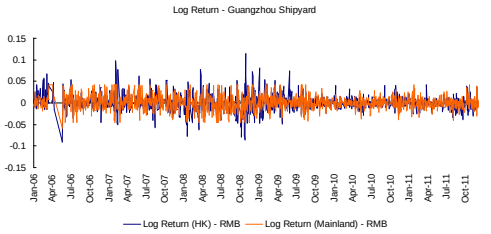


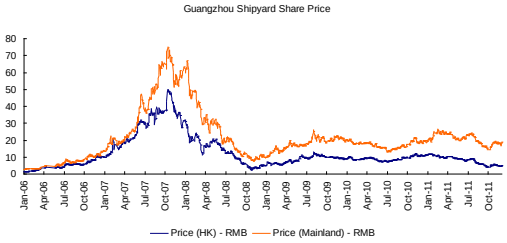


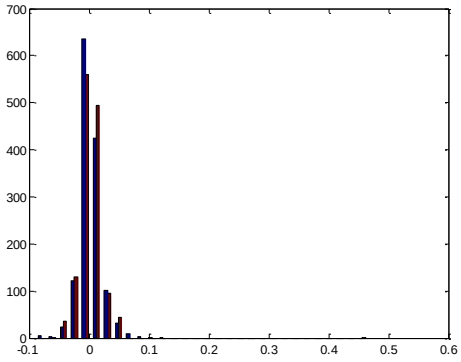




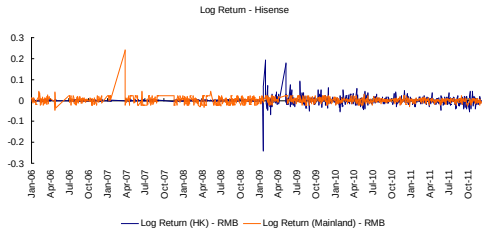
Guangzhou Shipyard

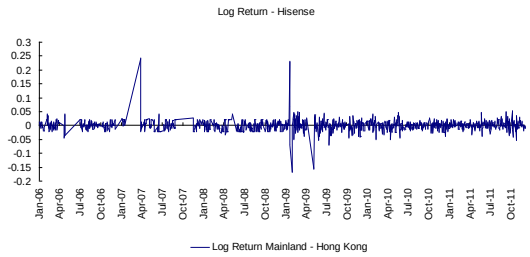


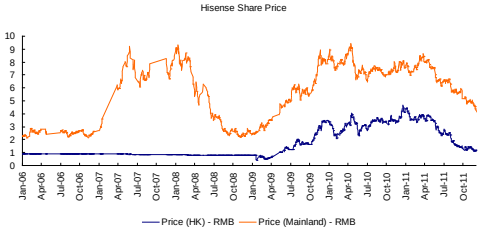


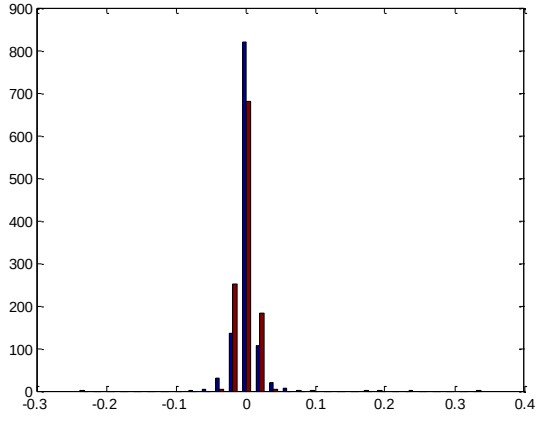


Hisense

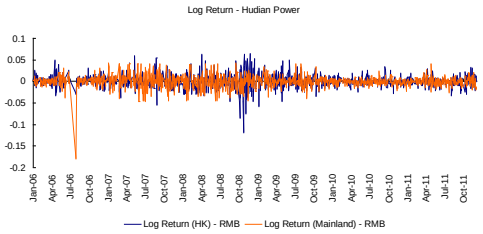


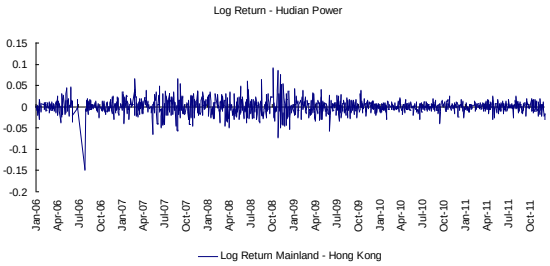


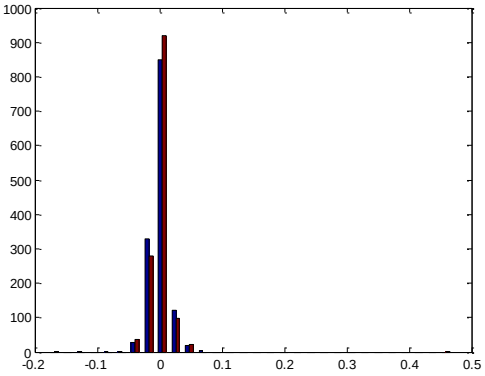




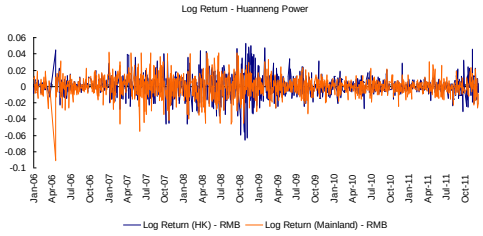
Hudian Power

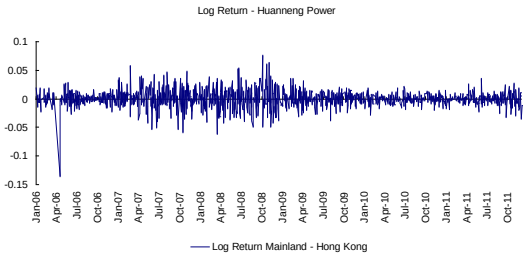


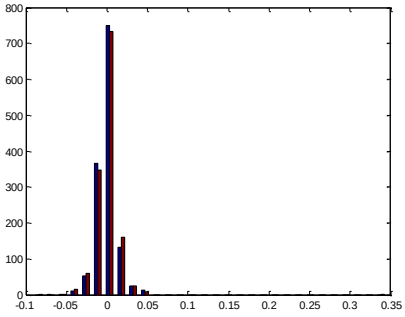




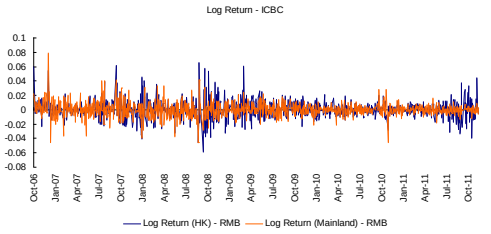
Huanneng

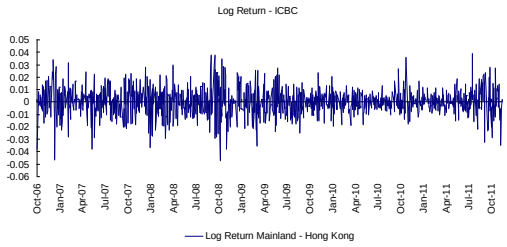


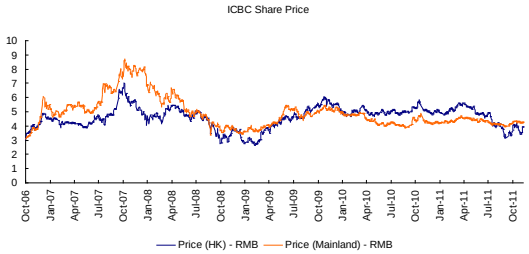


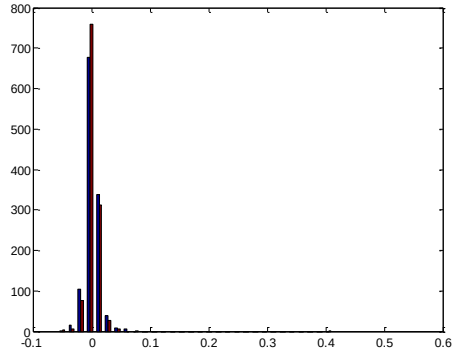


ICBC

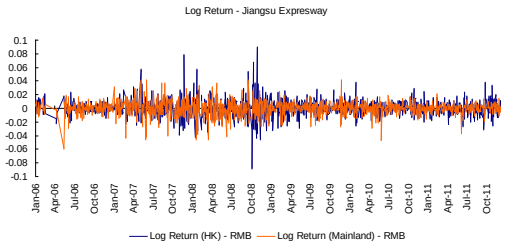


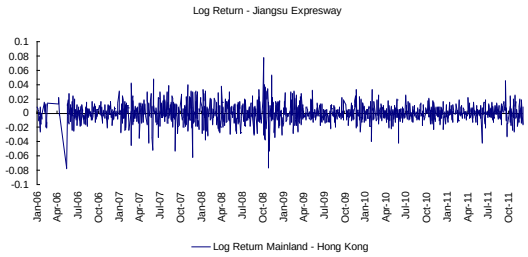


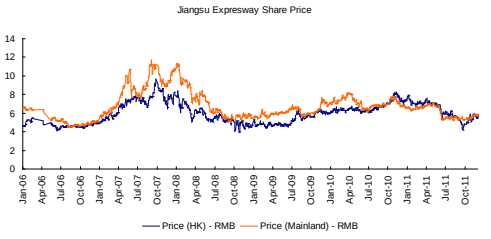


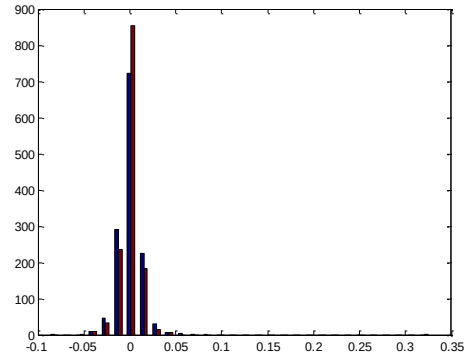


Jiangsu Expressway

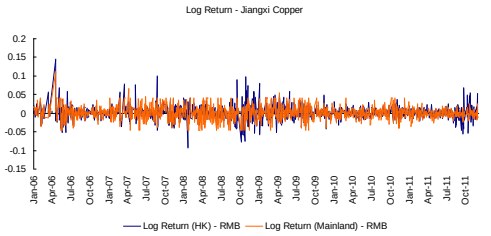


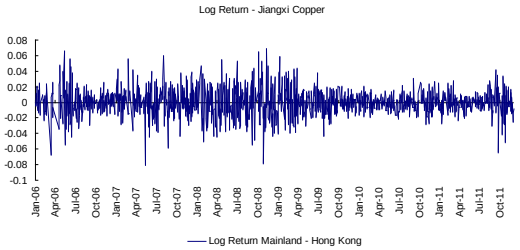


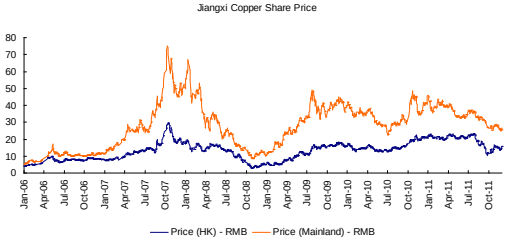


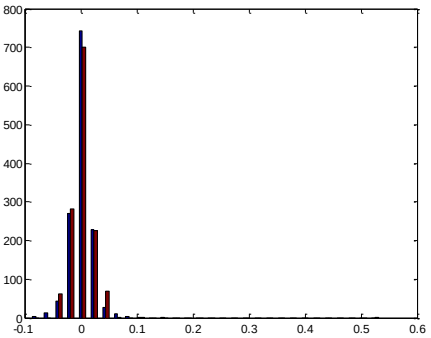


Jiangxi Copper

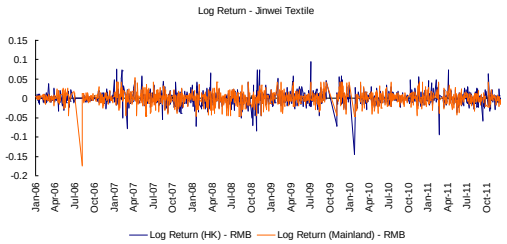


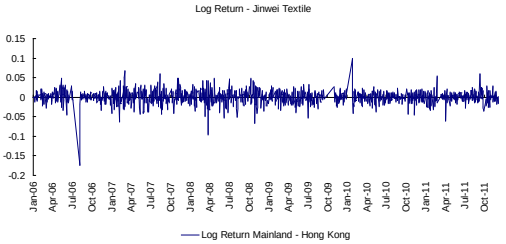


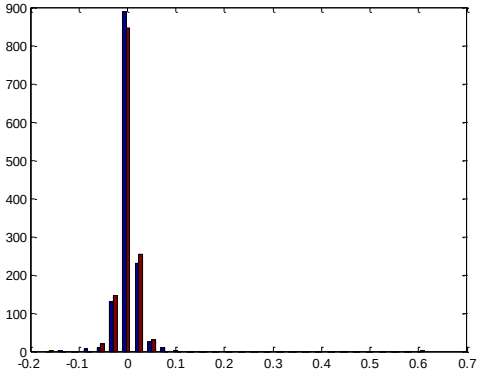




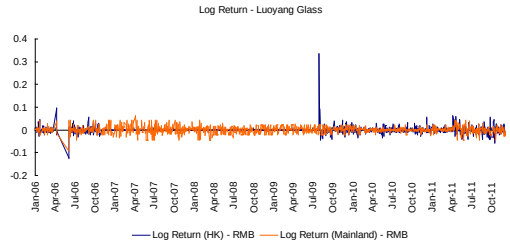
Jinwei Textile

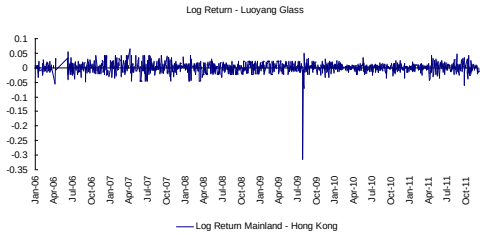


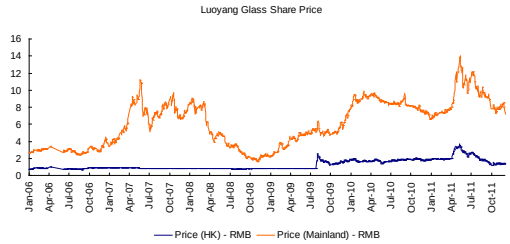


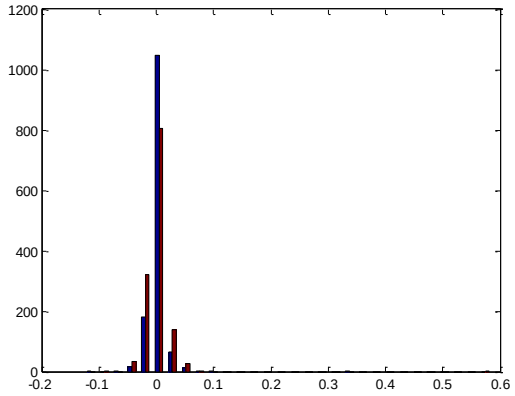


Luoyang Glass









Appendix 4 - CSRC top management

Currently the top management of the CSRC is formed by the Chairman (Dr. Guo Shuqing), five Vice Chairmans and three Assistants of the Chairman. All of them hold postgraduate degrees and considerable experience in the world of finance.

Dr. Guo Shuqing is the current chairman of the SCRC. He has more than 20 years of experience in finance previously holding several high level roles such Deputy Governor of the Party Committee of the People's Bank of China or Party Secretary of the State Administration of Foreign Exchange. Dr. Guo Shuqing holds a Ph.D in Law.

Dr Gui Minjie is the Vice Chairman if the CSRC. Similarly to Dr. Guo Shuqing he has in excess of 20 years of experience with some very senior roles such as President of the Shenzhen Stock Exchange or Director of the Department of Legal Affairs of the CSRC.

Dr, Zhuang Xinyi is a Vice Chairman of the CSRC. Similarly to Dr Gui Minjie Dr. Zhuang Xinyiis a former president of the Shenzhen stock exchange. He also hold some very senior roles in the industry such as Deputy Director of the Credit Department of China Construction Bank or Depty General Manager of China Construction Bnak Trust Investment. Dr. Zhunag Xinyi holds a Ph.D in economics.

Dr. Yao Gang is a Vice Chairman of the CSRC. He holds a Ph.D in Economics. He was the General Manager and Deputy Party Secretary and Vice Board Chariman of Goutai Junan Securities. He holds a Ph.D in economics.

Dr. Liu Xinhua is a Vice Chairman of the CSRC. Previously he was an Assistant Chairman of

the CSRC and Chief of Staff of the CSRC Party Committee. He holds a Ph.D in Economics

Mr. Li Xiaohong is a Vice Chairman of the CSRC. He has more than 40 years of professional experience and an extensive industry background. He was recently appointed Secretary if Discipline Inspection Committee of the CSRC. Mr. Li Xiahong holds a Masters in Engineering.

Dr Jiang Yang is an Assistant of the Chairman. Previously he had several senior positions at the People's Bank of China. More recently he was a Director at the Department of Intermediary Supervision of the CSRC. Dr Jiang Yang holds a Ph.D in economics.

Mr. Zhu Congjiu an Assistant of the Chairman. Previously he was the CSRC Deputy Head of Staff and Vice President of the Shanghai Stock Exchange

Appendix 5 - Acronyms

SAFE – State Administration of Foreign Exchange

CSRC – China Securities Regulatory Commission

CNY – Chinese Yuan

RMB – Chinese Yuan

HKD – Hong Kong Dollar

PBoC – Peoples Bank of China (China's central Bank)

HKMA –Hong Kong Monetary Authority (de-facto central bank of Hong Kong)

BOC – Bank of China

SASAC - State-owned Asset Supervision and Administration Commission of the State Council

CRC – China Resources Co., Limited

CRNC – China Resources National Corporation

Appendix 6
Extract from Hong Kong Stock Exchanges Trading Rules

If a Typhoon Signal No. 8 or above is hoisted at any time prior to 9:00 a.m.:	*The position will be as follows:* *- Commencement of trading in the Pre-opening Session will take place at 9:00 a.m. as usual if the Signal is lowered at or before 7:00 a.m..* *- There will be no trading in the Pre-opening Session if the Signal is lowered after 7:00 a.m..* *- Commencement of trading in the Morning Session will take place:* *at 9:30 a.m. as usual if the Signal is lowered at or before 7:30 a.m.;* *at 10:00 a.m. if the Signal is lowered at or before 8:00 a.m.;* *at 10:30 a.m. if the Signal is lowered at or before 8:30 a.m.; or* *at 11:00 a.m. if the Signal is lowered at or before 9:00 a.m..* *- There will be no trading in the Morning Session if the Signal is lowered after 9:00 a.m..* *- Commencement of trading in the Afternoon Session will take place:* *prior to 5 March 2012, at 1:30 p.m. if the Signal is lowered at or before 11:00 a.m.; and on or after 5 March 2012, at 1:00 p.m. if the Signal is lowered at or before 11:00 a.m.;* *at 1:30 p.m. if the Signal is lowered at or before 11:30 a.m.; or* *at 2:00 p.m. if the Signal is lowered at or before 12:00 noon.* *- There will be no trading for the day if the Signal is lowered after 12:00 noon.*
If a Typhoon Signal No. 8 or above is hoisted during the Pre-opening Session:	*The position will be as follows:* *- Trading in the Pre-opening Session will continue until the end of the Session but there will be no trading in the Morning Session*

	and the Extended Morning Session. *- Commencement of trading in the Afternoon Session will take place:* *prior to 5 March 2012, at 1:30 p.m. if the Signal is lowered at or before 11:00 a.m.; and on or after 5 March 2012, at 1:00 p.m. if the Signal is lowered at or before 11:00 a.m.;* *at 1:30 p.m. if the Signal is lowered at or before 11:30 a.m.; or* *at 2:00 p.m. if the Signal is lowered at or before 12:00 noon.* *- There will be no trading in the Morning Session, the Extended Morning Session and the Afternoon Session if the Signal is lowered after 12:00 noon.*
If a Typhoon Signal No. 8 or above is hoisted during the Morning Session:	*The position will be as follows:* *- Trading will be terminated 15 minutes after the hoisting of the Signal and there will be no trading in the Extended Morning Session.* *- Commencement of trading in the Afternoon Session will take place:* *- prior to 5 March 2012, at 1:30 p.m. if the Signal is lowered at or before 11:00 a.m.; and on or after 5 March 2012, at 1:00 p.m. if the Signal is lowered at or before 11:00 a.m.;* *- at 1:30 p.m. if the Signal is lowered at or before 11:30 a.m.; or* *- at 2:00 p.m. if the Signal is lowered at or before 12:00 noon.* *- There will be no trading in the Extended Morning Session and the Afternoon Session if the Signal is lowered after 12:00 noon.*
If a Typhoon Signal No. 8 or above is hoisted after the end of the Morning Session but before the commencement of the Afternoon Session (i.e. during the Extended Morning	*The position will be as follows:* *- If there was trading in the Morning Session, trading in the Extended Morning Session will be terminated 15 minutes after the hoisting of the Signal and there will be no trading in the Afternoon Session.* *- If there was no trading in the Morning Session and pursuant to*

Session):	*Rule 501B, no trading in the Extended Morning Session, there will also be no trading in the Afternoon Session.*
If a Typhoon Signal No. 8 or above is hoisted during the Afternoon Session:	*The position will be as follows:* *- Trading will be terminated 15 minutes after the hoisting of the Signal and there will be no trading for the rest of the day.*

Appendix 7 – Markov-switching Results
Air China

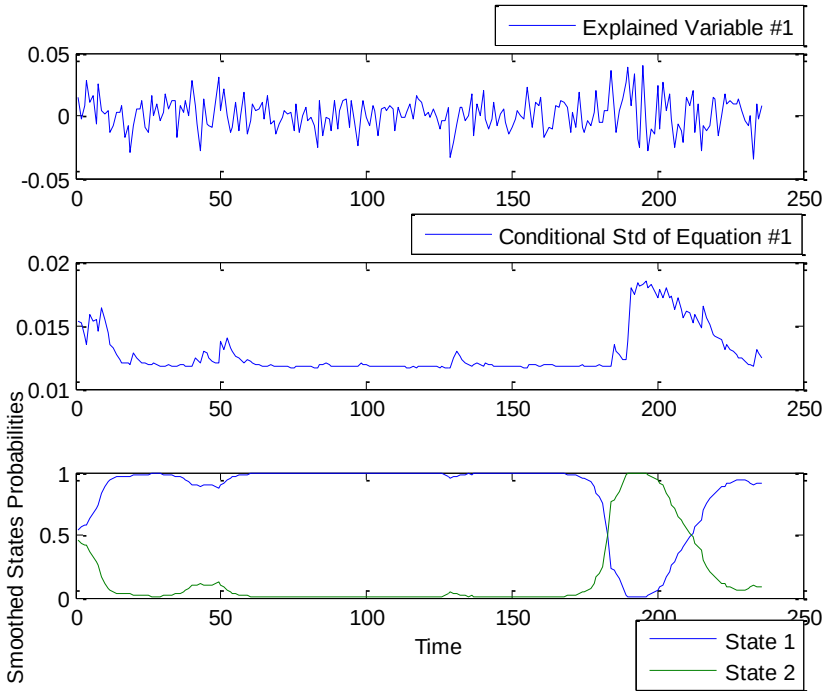
Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000133
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000360
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0006
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0035
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)

0.99 (0.00,0.00)	0.06 (0.00,0.00)
0.01 (0.00,0.00)	0.94 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 121.62 time periods
Expected duration of Regime #2: 17.97 time periods



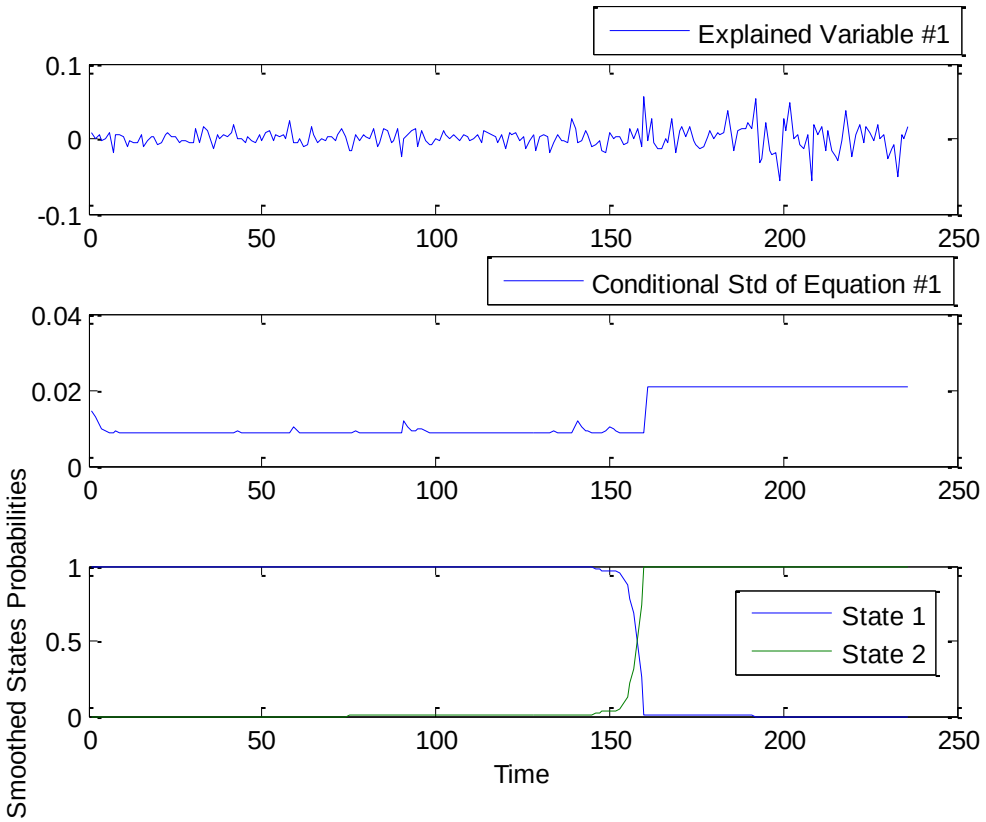
Angang Steel

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000070
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000442
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1

State 1
Value: 0.0005
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0009
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.00 (0.00,0.00)
0.01 (0.00,0.00) 1.00 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 157.38 time periods
Expected duration of Regime #2: Inf time periods



Anhui Conch

Switching Parameters (Regressors)

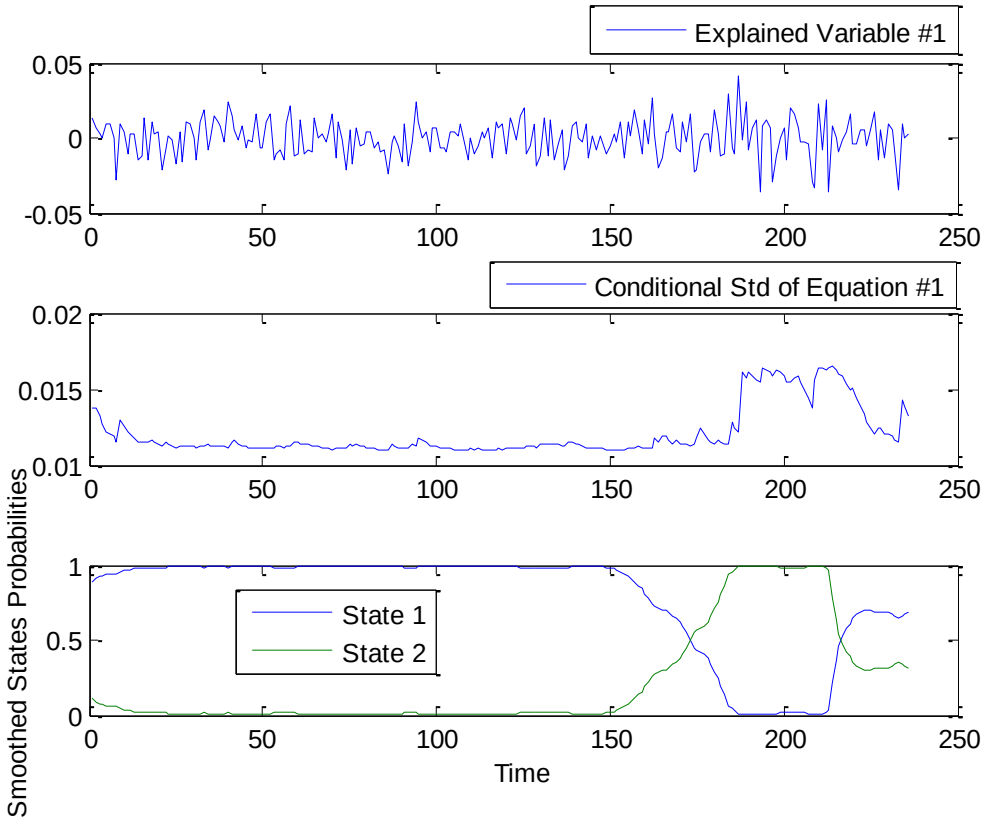
Switching Parameters for Equation #1 - Indep column 1

State 1
Value: -0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0003
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)

0.99 (0.00,0.00)	0.02 (0.00,0.00)
0.01 (0.00,0.00)	0.98 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 134.59 time periods
Expected duration of Regime #2: 44.31 time periods

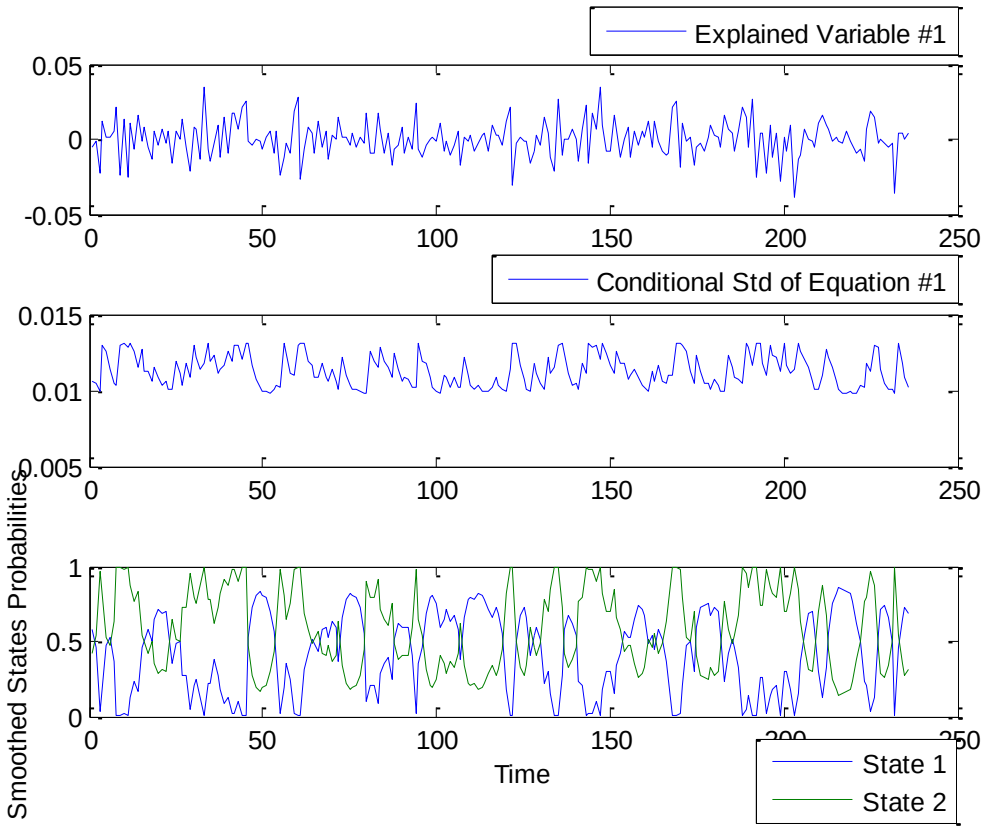


Anhui Highway

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000044
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000215
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)

Switching Parameters for Equation #1
State 1
Value: -0.0006
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0007
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.74 (0.00,0.00) 0.19 (0.00,0.00)
0.26 (0.00,0.00) 0.81 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 3.82 time periods
Expected duration of Regime #2: 5.31 time periods



Bank of Communications

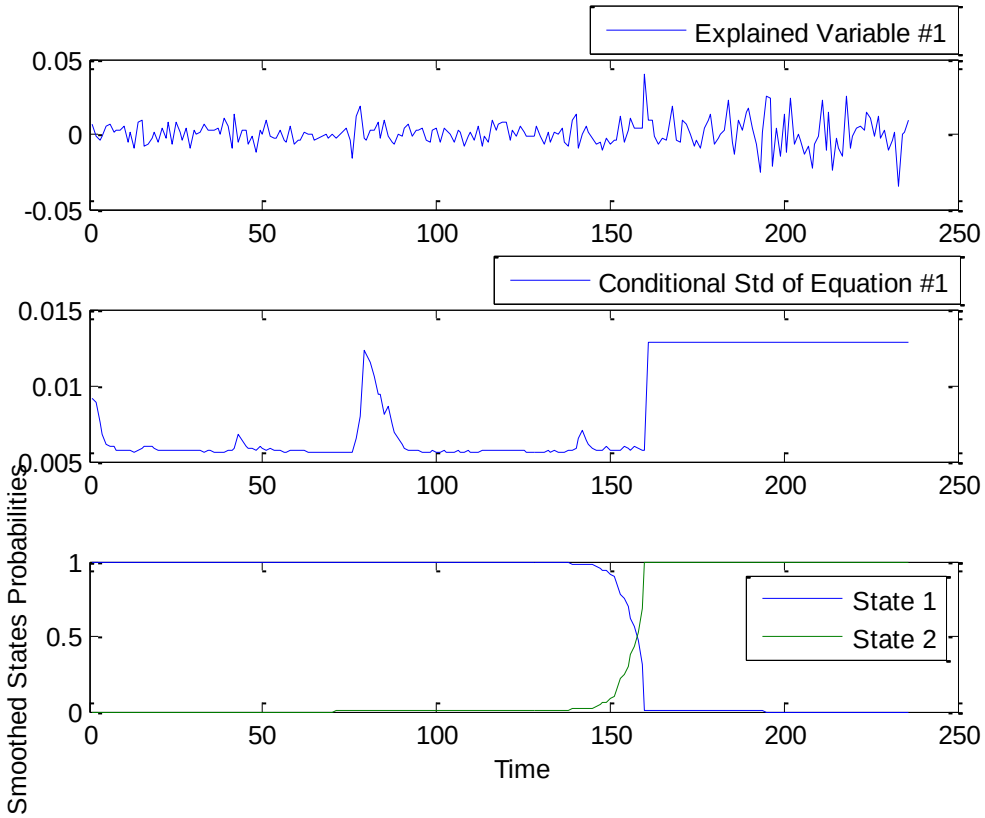
Non Switching Parameters
Switching Parameters (Distribution Parameters)

State 1
Model's Variance: 0.000031
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000163
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0002
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0010
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)

0.99 (0.00,0.00)	0.00 (0.00,0.00)
0.01 (0.00,0.00)	1.00 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 156.43 time periods
Expected duration of Regime #2: Inf time periods



Bank of China

Non Switching Parameters

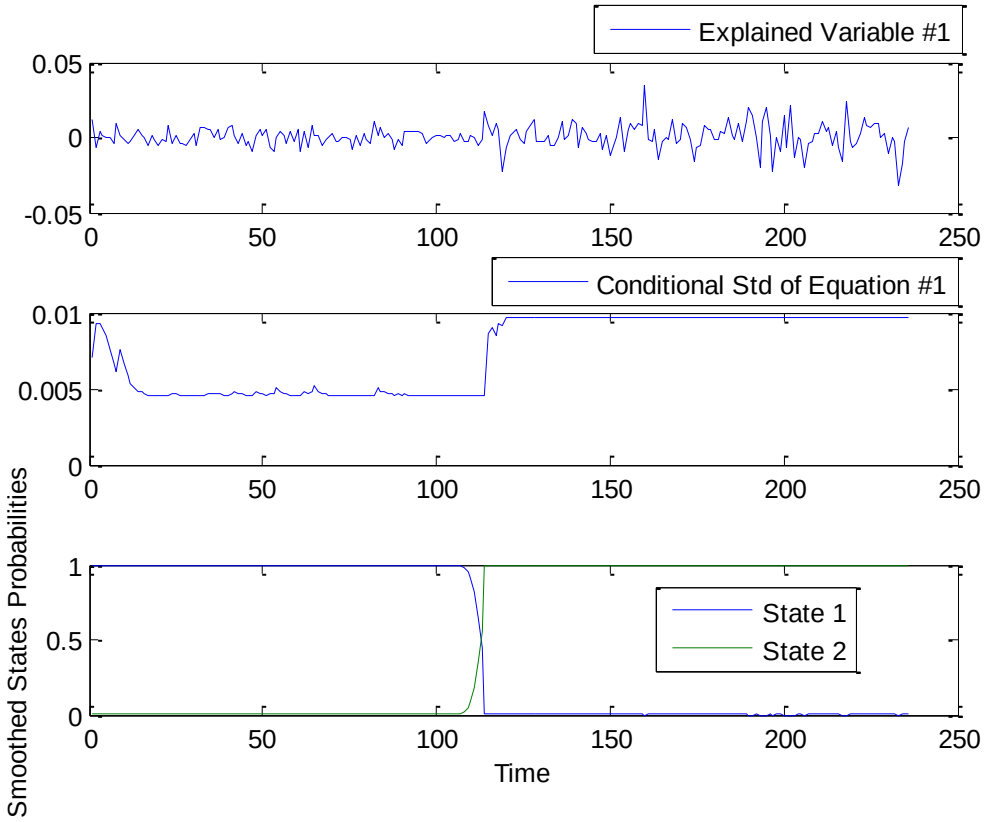
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000020
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000094
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)

Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0011
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.00 (0.00,0.00)
0.01 (0.00,0.00) 1.00 (0.00,0.00)

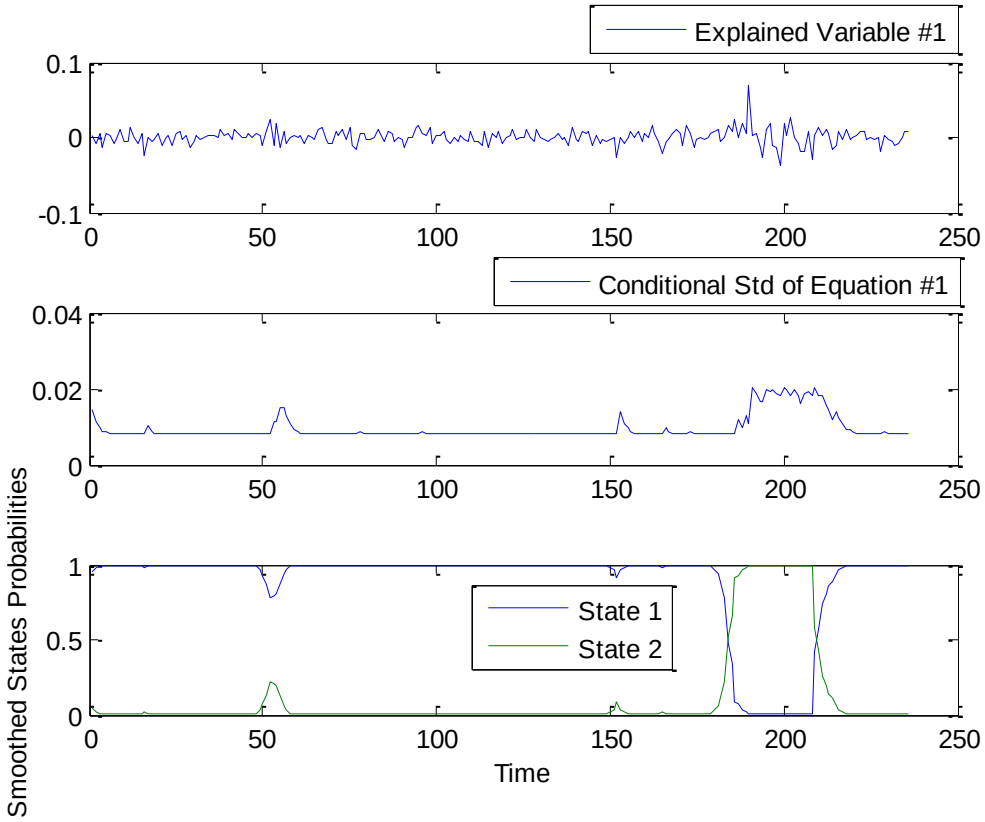
Expected Duration of Regimes
Expected duration of Regime #1: 113.54 time periods
Expected duration of Regime #2: 22919082073132.30 time periods



Beijing North Star

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000061
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000430
Std Error (p. value): 0.0000 (0.00)

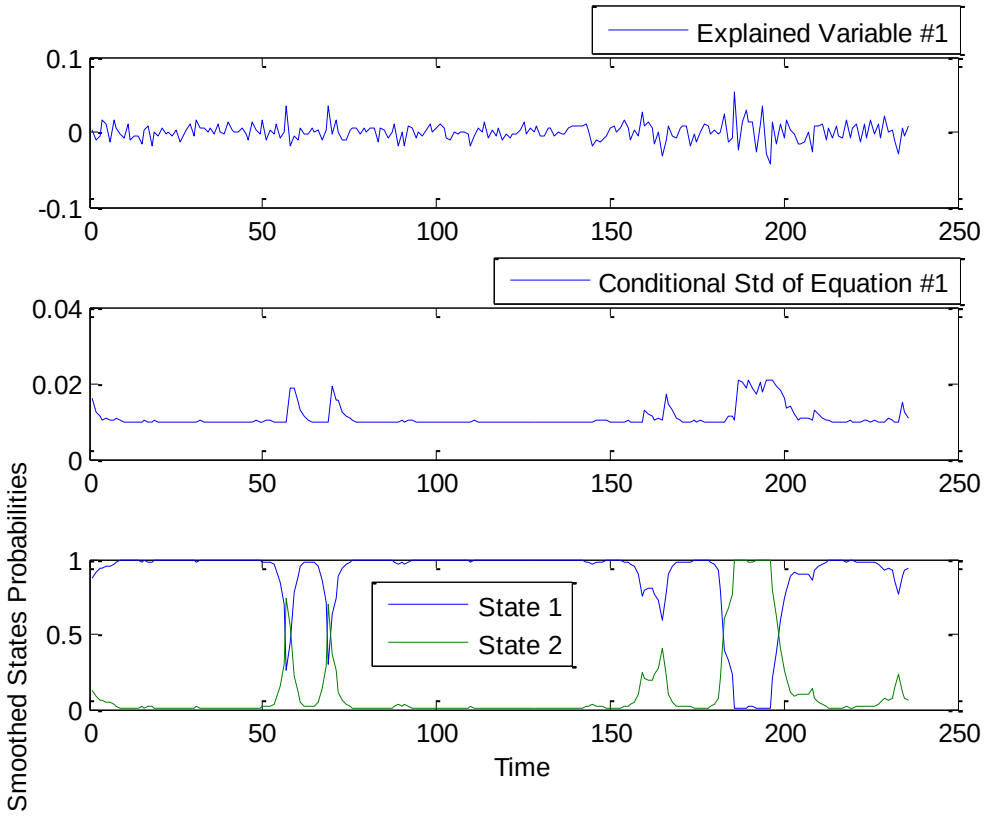
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0022
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.06 (0.00,0.00)
0.01 (0.00,0.00) 0.94 (0.00,0.00)
Expected Duration of Regimes <---
Expected duration of Regime #1: 139.24 time periods
Expected duration of Regime #2: 18.08 time periods



China Coal Energy

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000086
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000535
Std Error (p. value): 0.0000 (0.00)

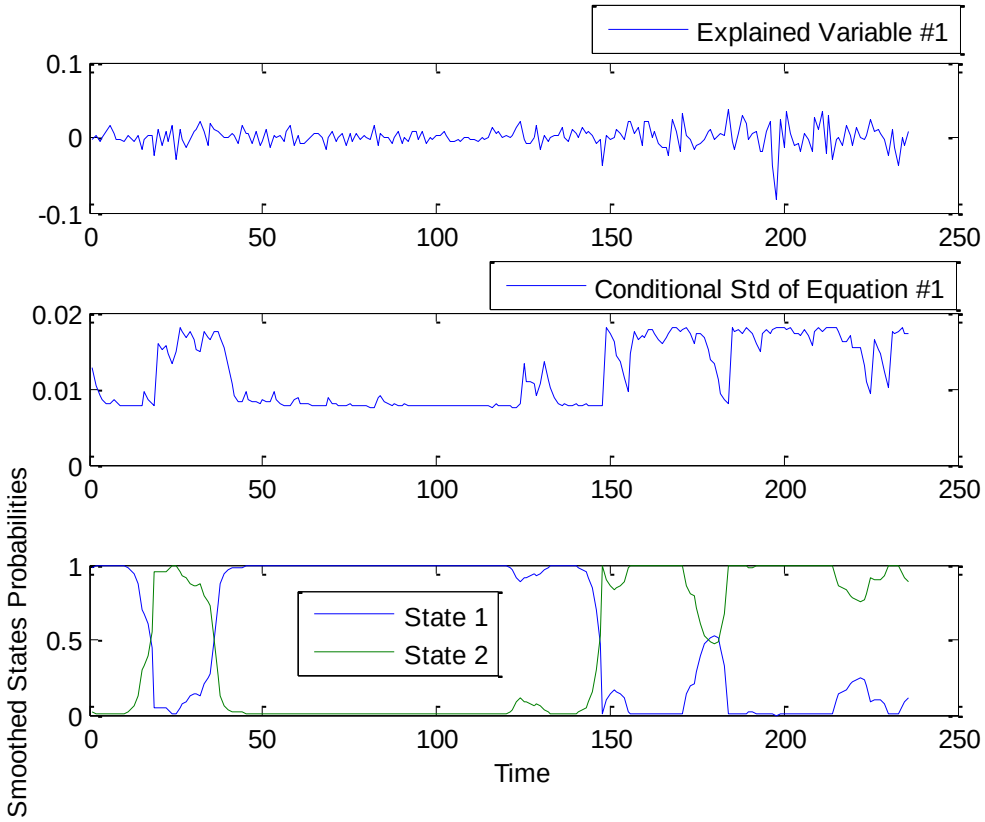
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0000
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0025
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value) <---
0.98 (0.00,0.00) 0.17 (0.00,0.00)
0.02 (0.00,0.00) 0.83 (0.00,0.00)
Expected Duration of Regimes <---
Expected duration of Regime #1: 48.85 time periods
Expected duration of Regime #2: 5.91 time periods



China Cosco

Non Switching Parameters
Switching Parameters (Distribution Parameters)

State 1
Model's Variance: 0.000051
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000332
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0010
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0004
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.03 (0.00,0.00)
0.03 (0.00,0.00) 0.97 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 39.08 time periods
Expected duration of Regime #2: 38.52 time periods

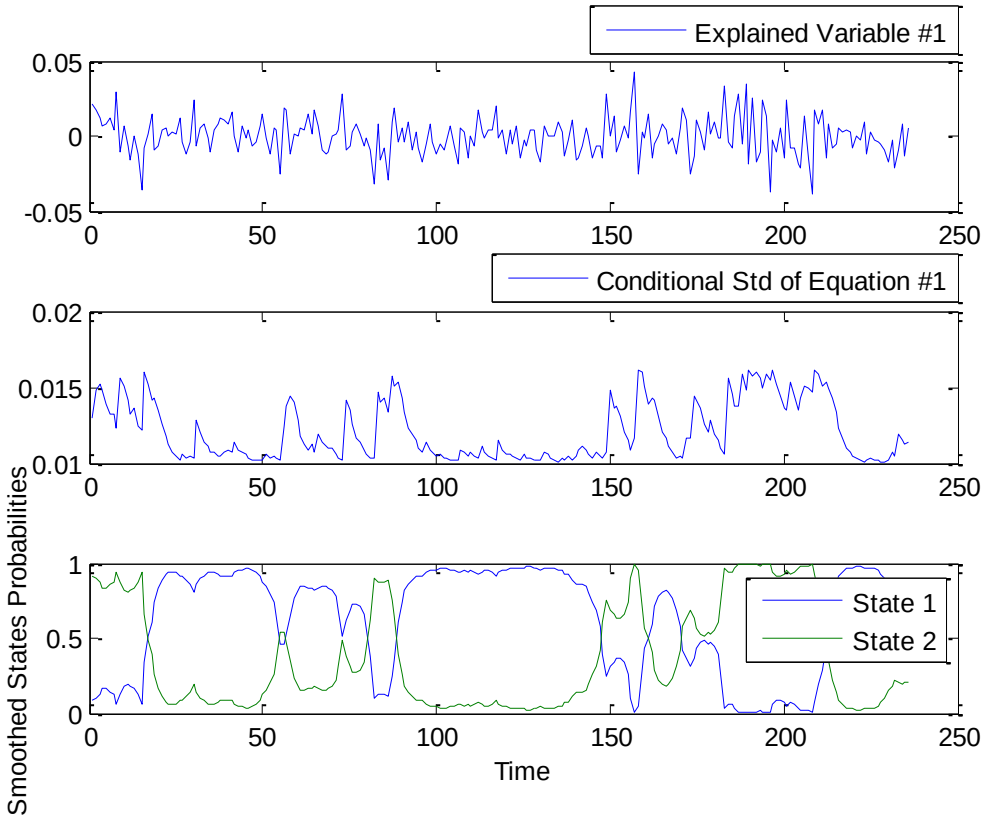


China Eastern Airlines

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000087
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000279
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1

State 1
Value: -0.0006
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0002
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.95 (0.00,0.00) 0.09 (0.00,0.00)
0.05 (0.00,0.00) 0.91 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 21.81 time periods
Expected duration of Regime #2: 11.75 time periods

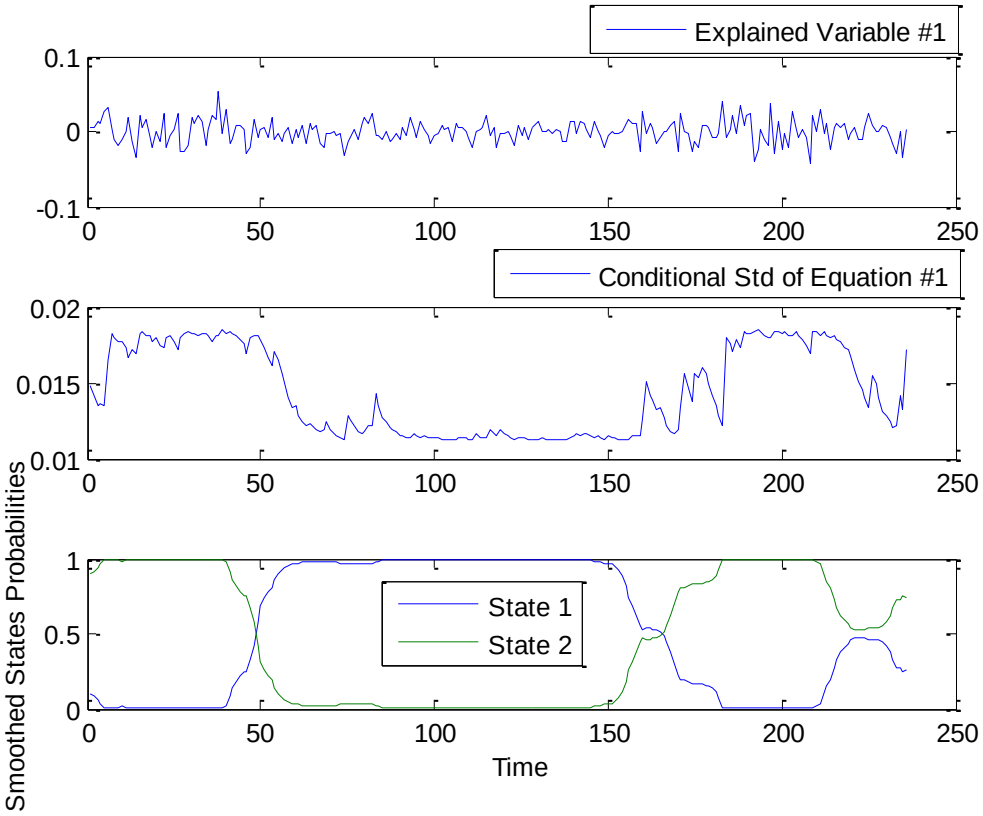


China Oilfield

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000120
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000344
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0009
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0007
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.02 (0.00,0.00)
0.01 (0.00,0.00) 0.98 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 74.41 time periods
Expected duration of Regime #2: 61.27 time periods

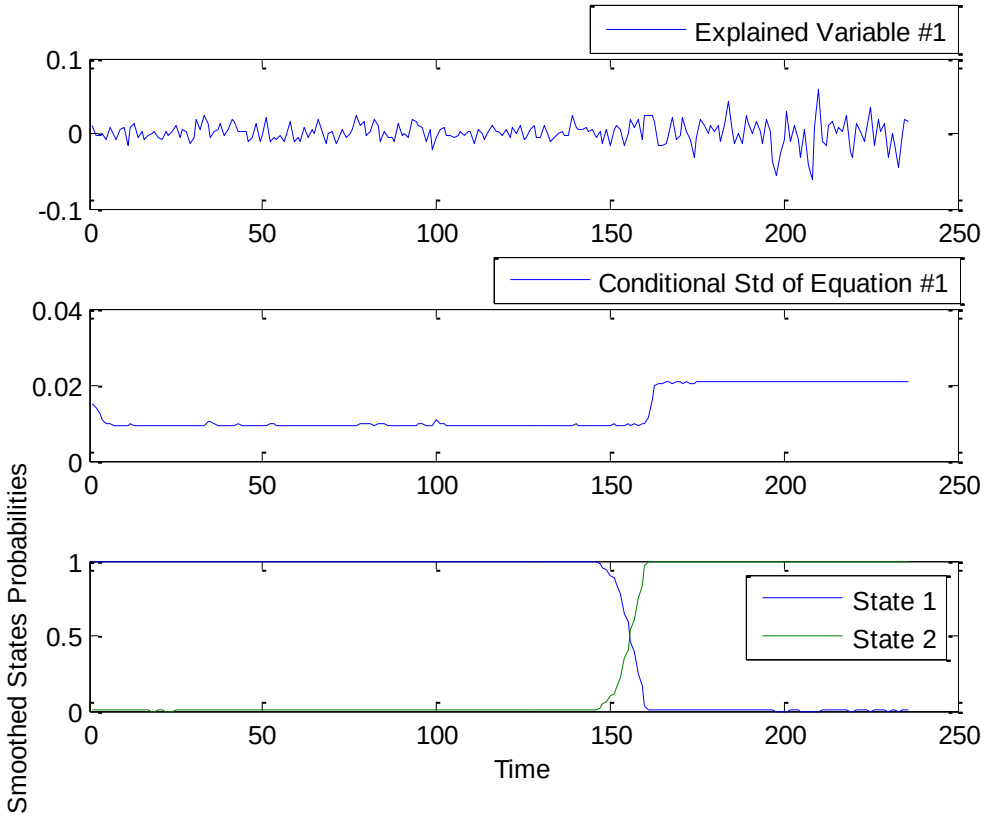


China Railway

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000081
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000439
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0013
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)

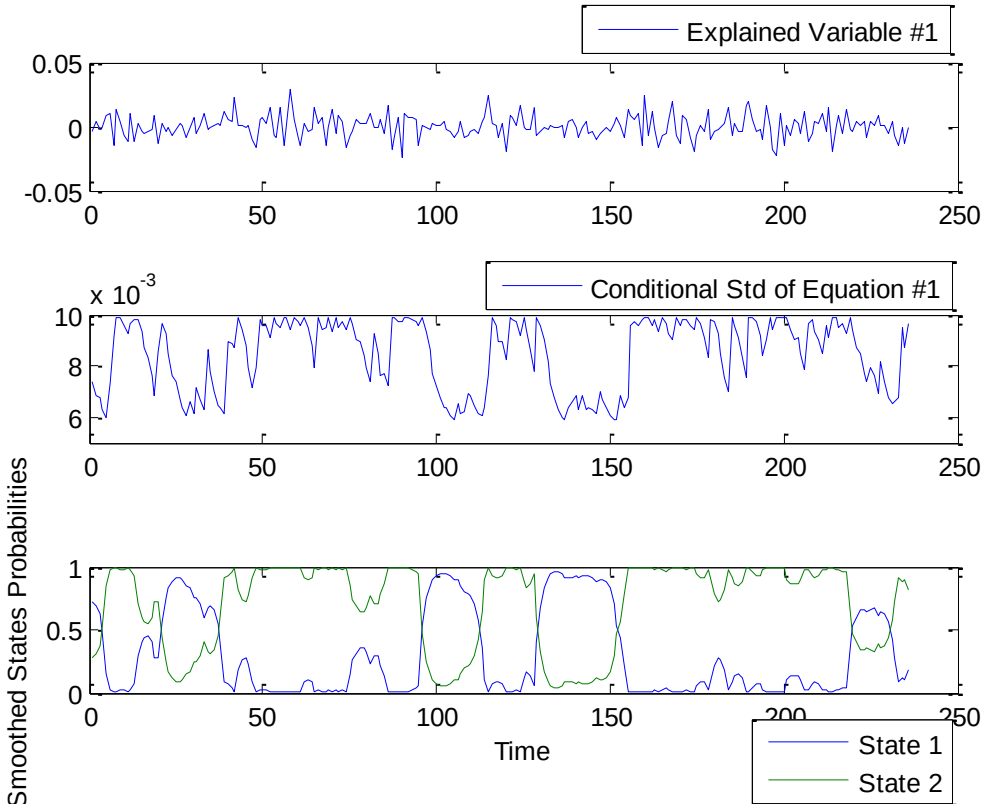
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.00 (0.00,0.00)
0.01 (0.00,0.00) 1.00 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 155.66 time periods
Expected duration of Regime #2: 44152937523240.16 time periods



China Shenhua

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000020
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000104
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0010
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.88 (0.00,0.00) 0.05 (0.00,0.00)
0.12 (0.00,0.00) 0.95 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 8.38 time periods
Expected duration of Regime #2: 20.38 time periods

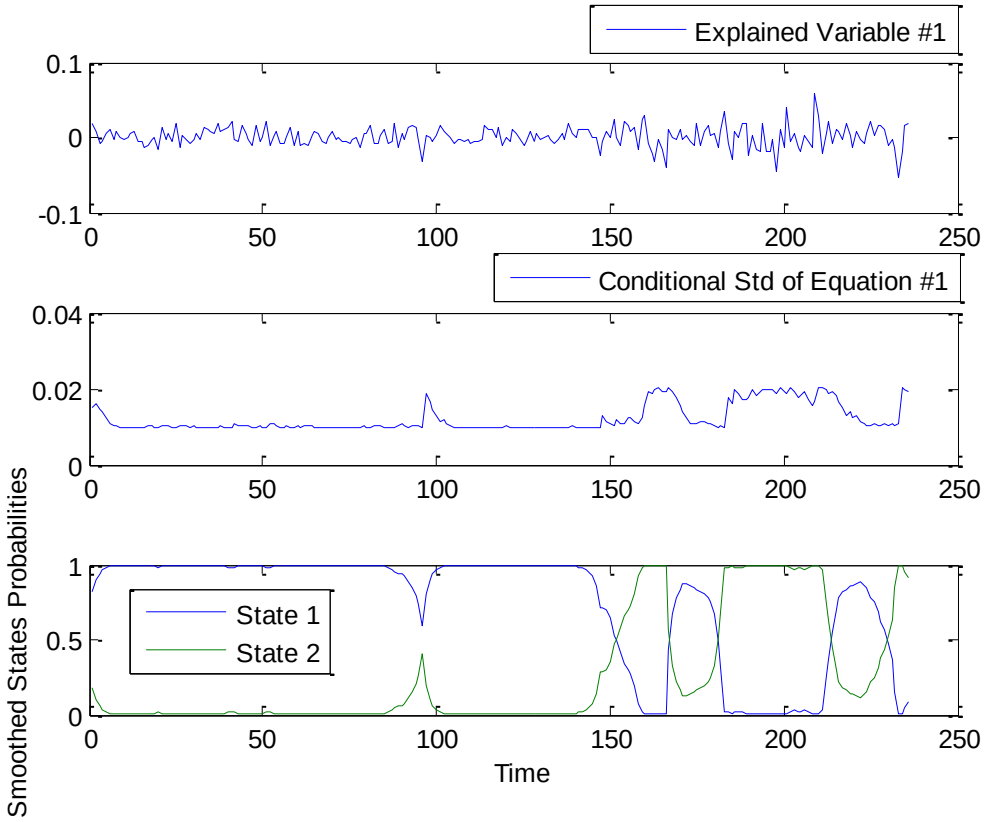


China Shipping

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000086
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000425
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0016
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0015
Std Error (p. value): 0.0000 (0.00)

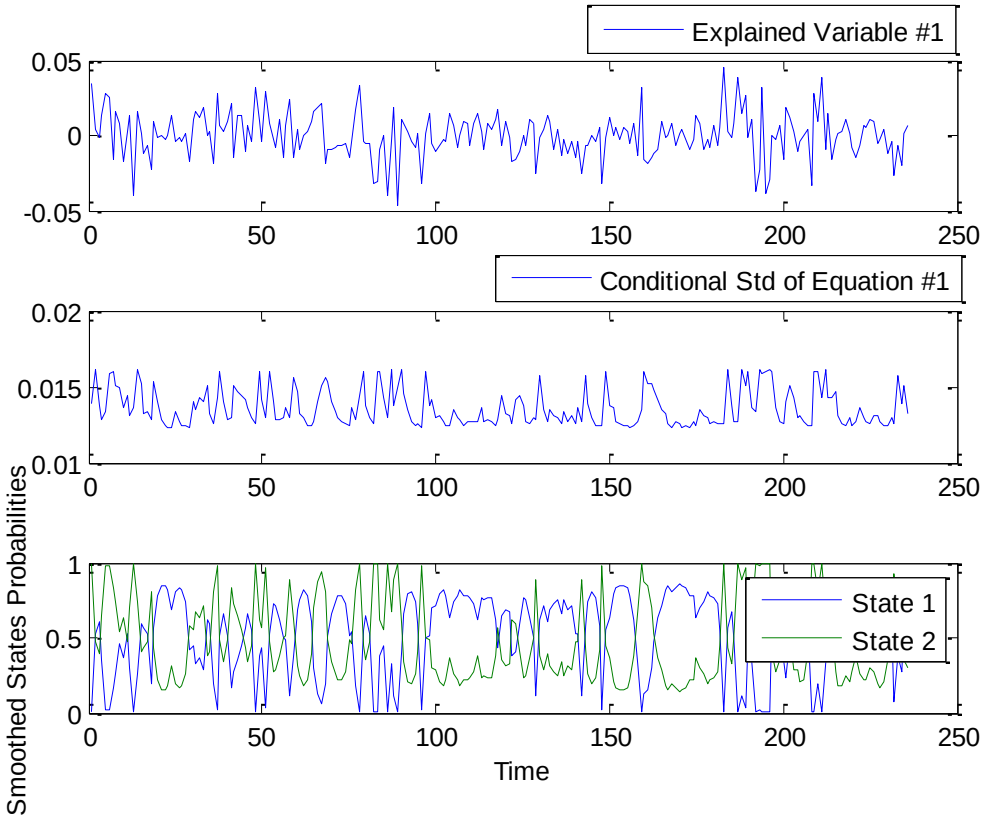
Transition Probabilities Matrix (std. error, p-value)
0.98 (0.00,0.00) 0.05 (0.00,0.00)
0.02 (0.00,0.00) 0.95 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 46.49 time periods
Expected duration of Regime #2: 19.93 time periods



China Southern Airlines

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000071
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000378
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0002
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0002
Std Error (p. value): 0.0000 (0.00)

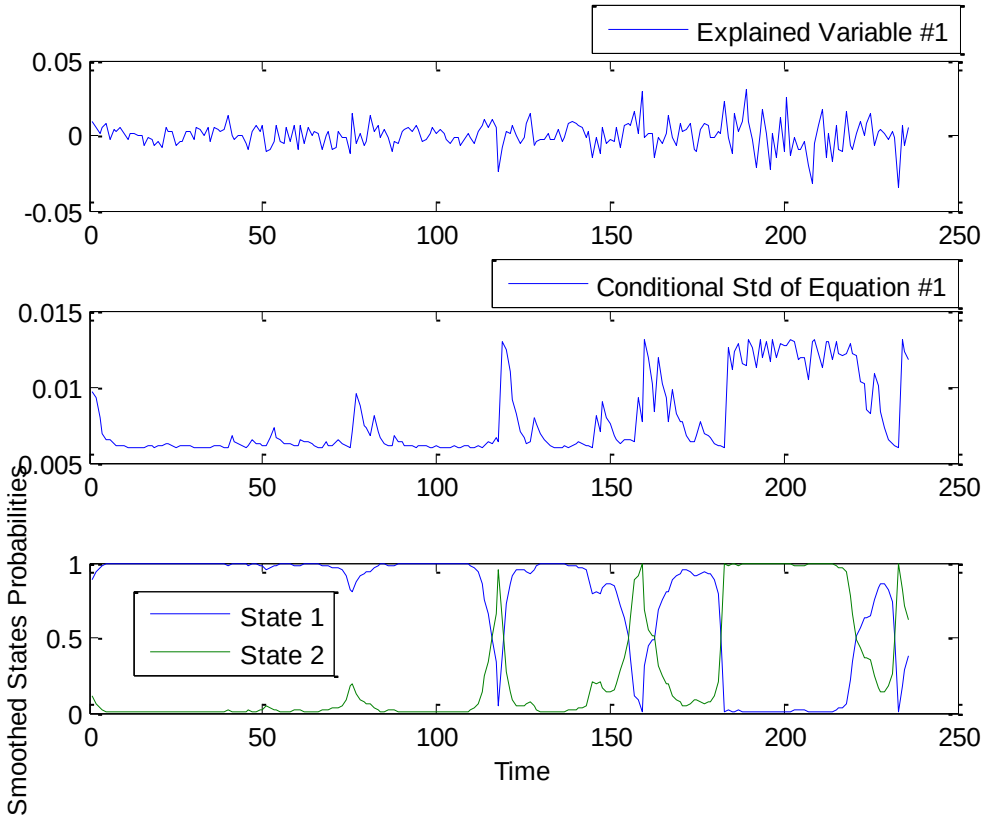
Transition Probabilities Matrix (std. error, p-value)
0.73 (0.00,0.00) 0.31 (0.00,0.00)
0.27 (0.00,0.00) 0.69 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 3.70 time periods
Expected duration of Regime #2: 3.27 time periods



CITIC

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000032
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000187
Std Error (p. value): 0.0000 (0.00)

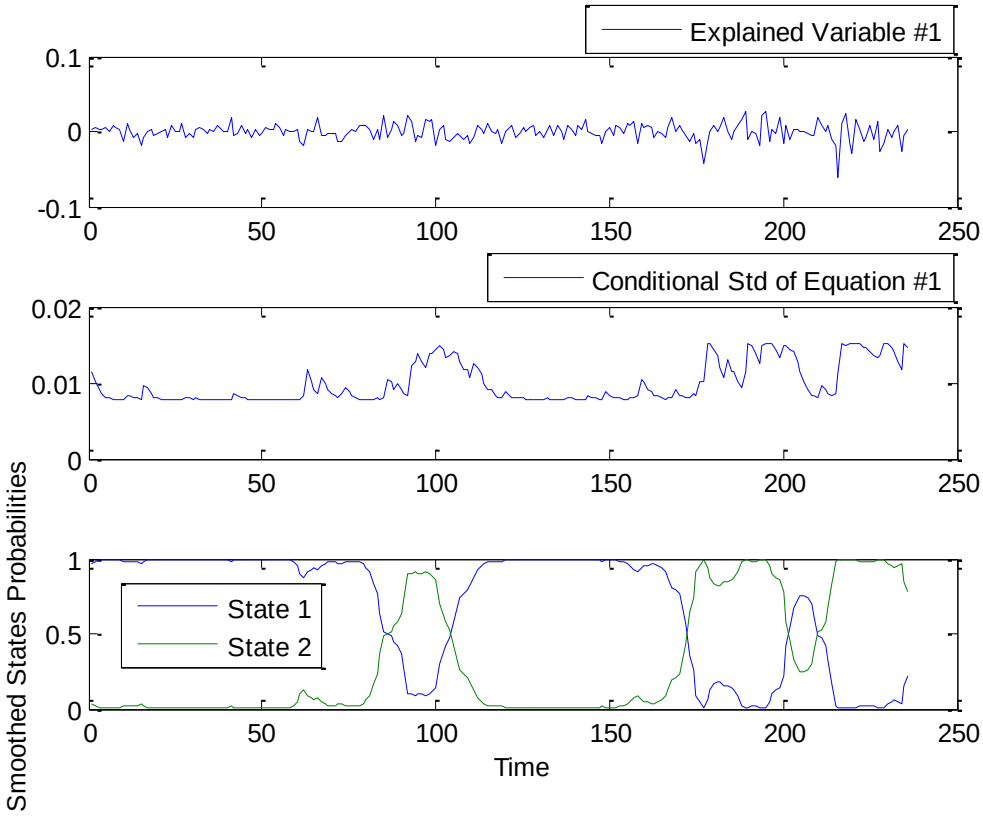
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0004
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0006
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.08 (0.00,0.00)
0.03 (0.00,0.00) 0.92 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 34.51 time periods
Expected duration of Regime #2: 13.18 time periods



Datang International

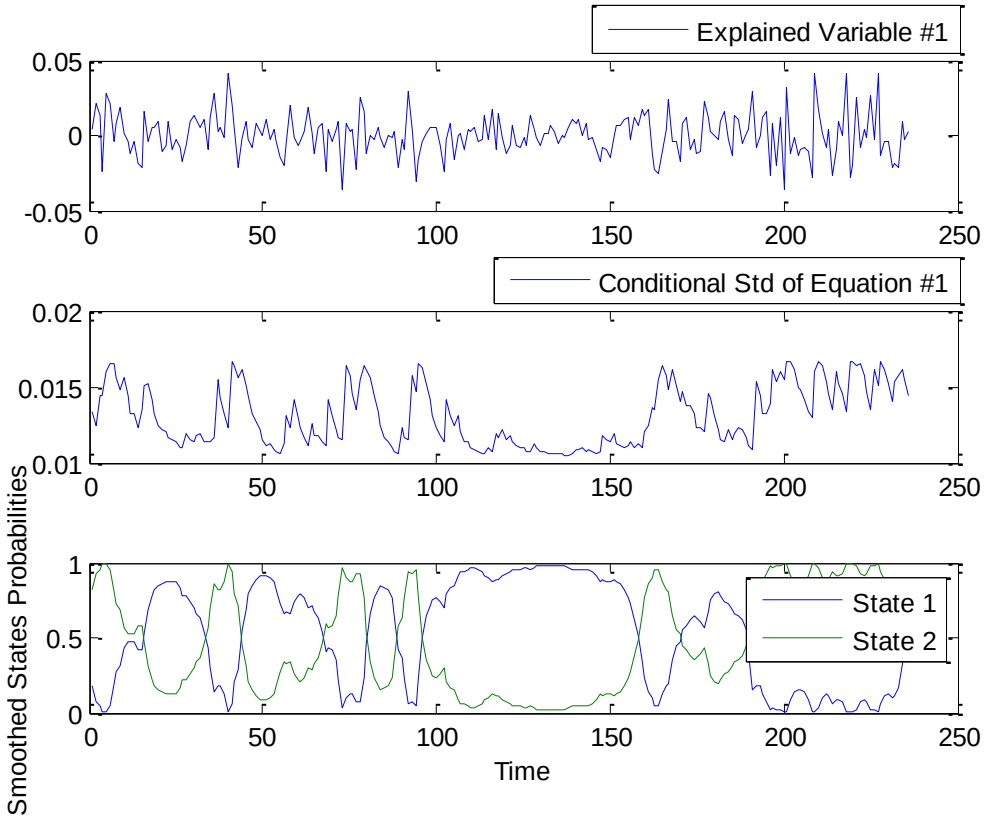
Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000055
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000243
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0018
Std Error (p. value): 0.0000 (0.00)

Transition Probabilities Matrix (std. error, p-value)
0.98 (0.00,0.00) 0.04 (0.00,0.00)
0.02 (0.00,0.00) 0.96 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 44.49 time periods
Expected duration of Regime #2: 24.96 time periods



Dongfang International

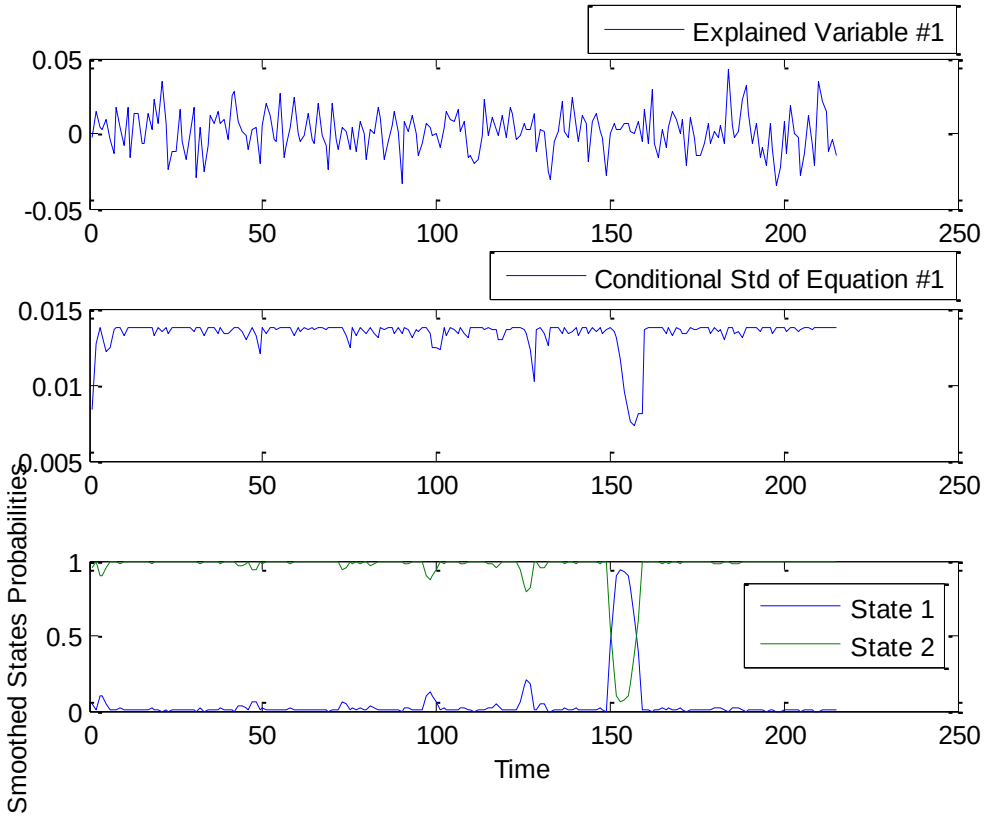
Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000088
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000298
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0007
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.93 (0.00,0.00) 0.08 (0.00,0.00)
0.07 (0.00,0.00) 0.92 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 14.64 time periods
Expected duration of Regime #2: 12.85 time periods



Guangzhou Pharma

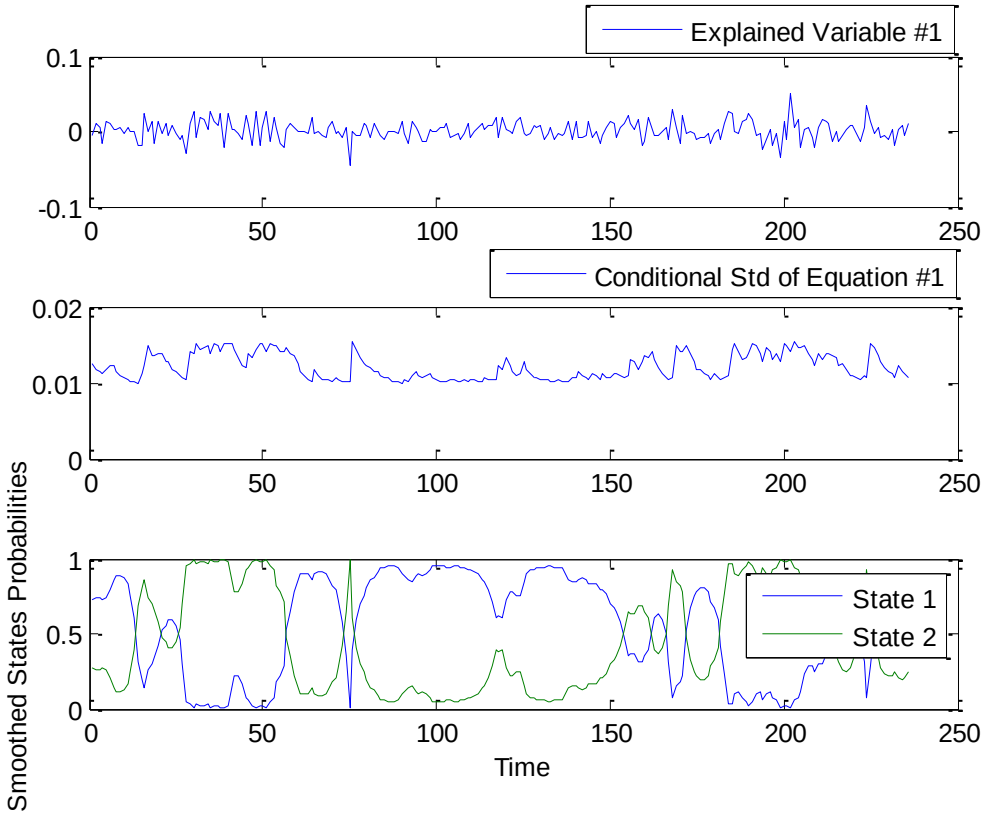
Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000008
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000191
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0037
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0008
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.74 (0.00,0.00) 0.01 (0.00,0.00)
0.26 (0.00,0.00) 0.99 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 3.79 time periods
Expected duration of Regime #2: 86.27 time periods



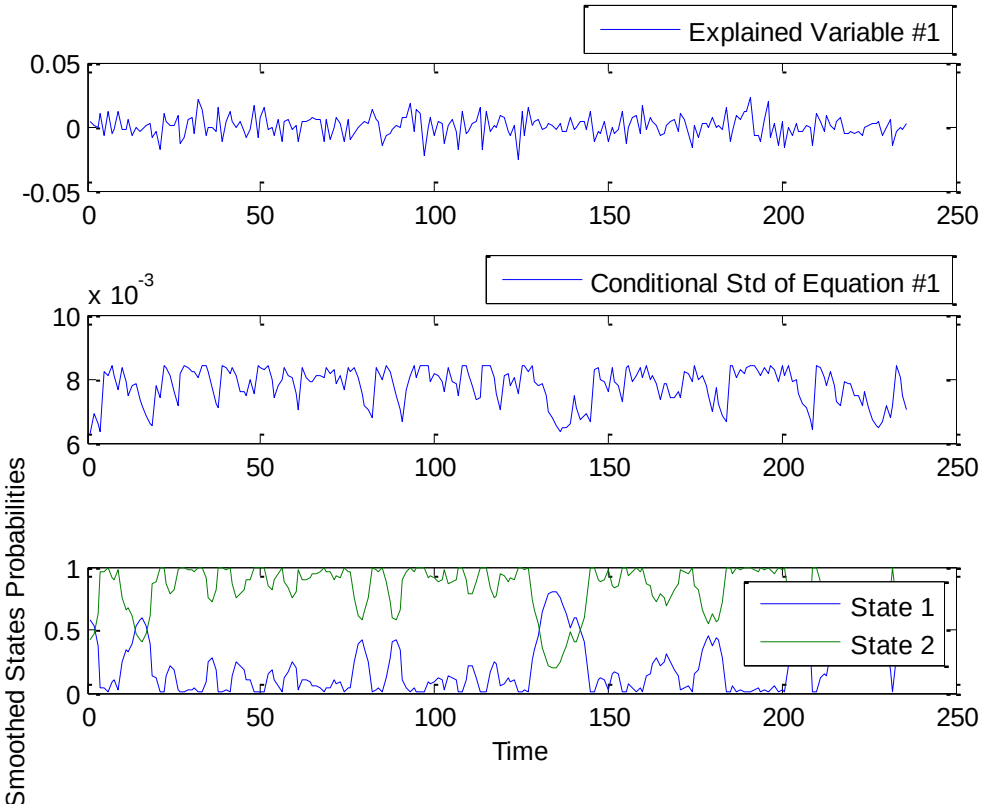
Guangzhou shipyard

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000079
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000255
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0028
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.93 (0.00,0.00) 0.09 (0.00,0.00)
0.07 (0.00,0.00) 0.91 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 13.42 time periods
Expected duration of Regime #2: 10.69 time periods



Guashen International

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000014
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000076
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0004
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.72 (0.00,0.00) 0.07 (0.00,0.00)
0.28 (0.00,0.00) 0.93 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 3.51 time periods
Expected duration of Regime #2: 14.51 time periods

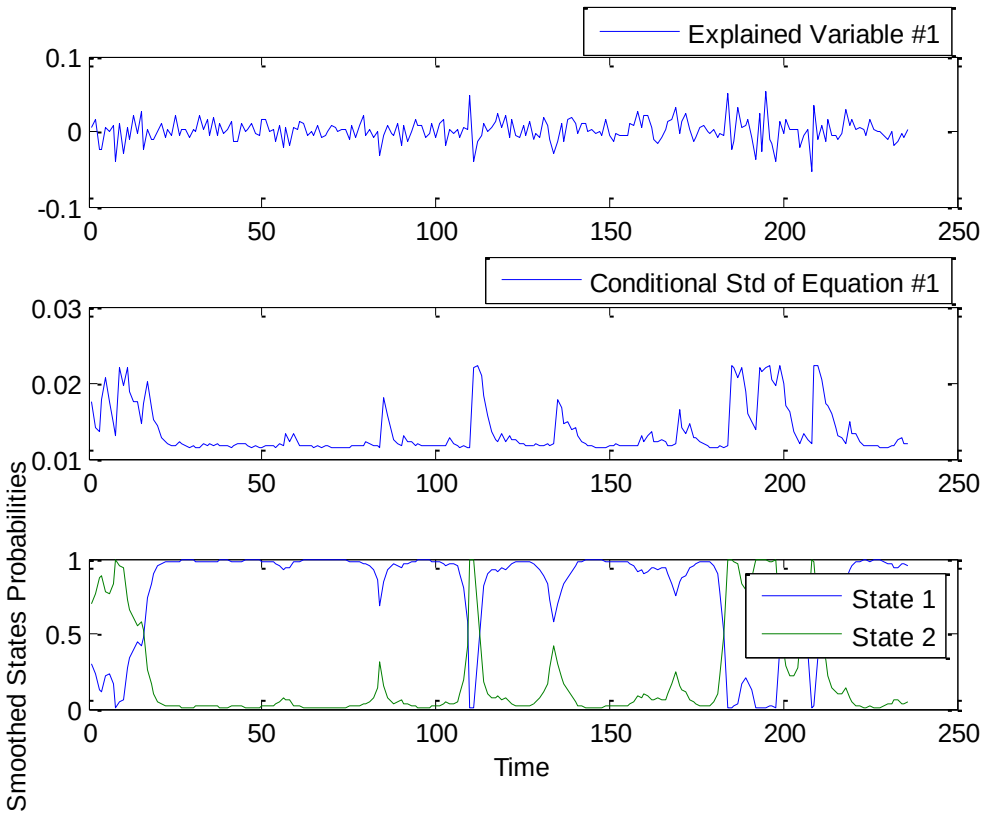


Hisense International

Switching Parameters for Equation #1
State 1
Value: 0.0016
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0018
Std Error (p. value): 0.0000 (0.00)

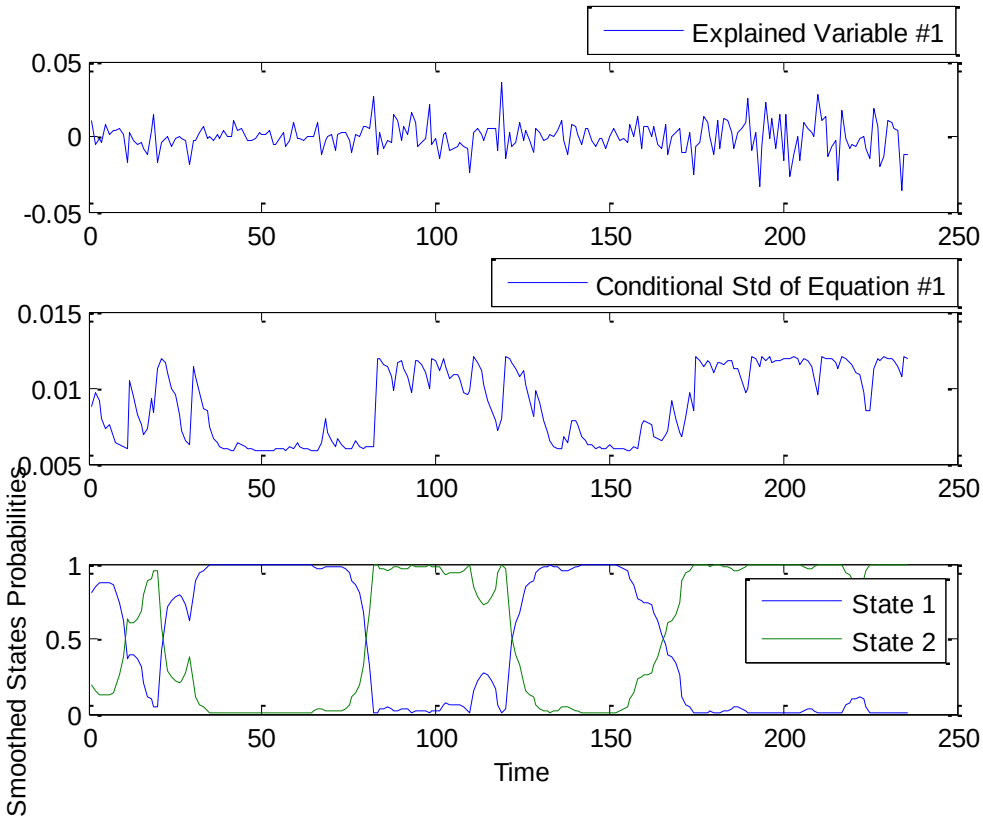
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.14 (0.00,0.00)
0.03 (0.00,0.00) 0.86 (0.00,0.00)

Expected Duration of Regimes <---
Expected duration of Regime #1: 29.83 time periods
Expected duration of Regime #2: 6.93 time periods



Huanneng

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000029
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000148
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0000
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0009
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.96 (0.00,0.00) 0.03 (0.00,0.00)
0.04 (0.00,0.00) 0.97 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 26.05 time periods
Expected duration of Regime #2: 35.32 time periods



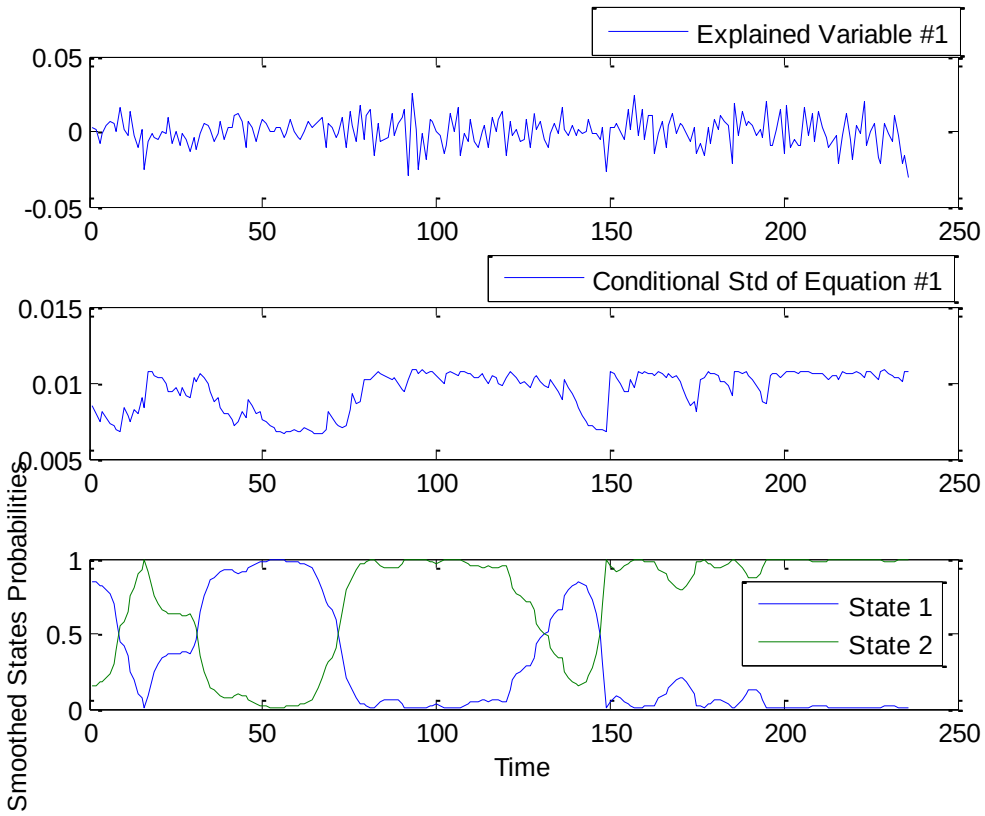
Hudan Power

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000035
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000119
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0011
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0008
Std Error (p. value): 0.0000 (0.00)

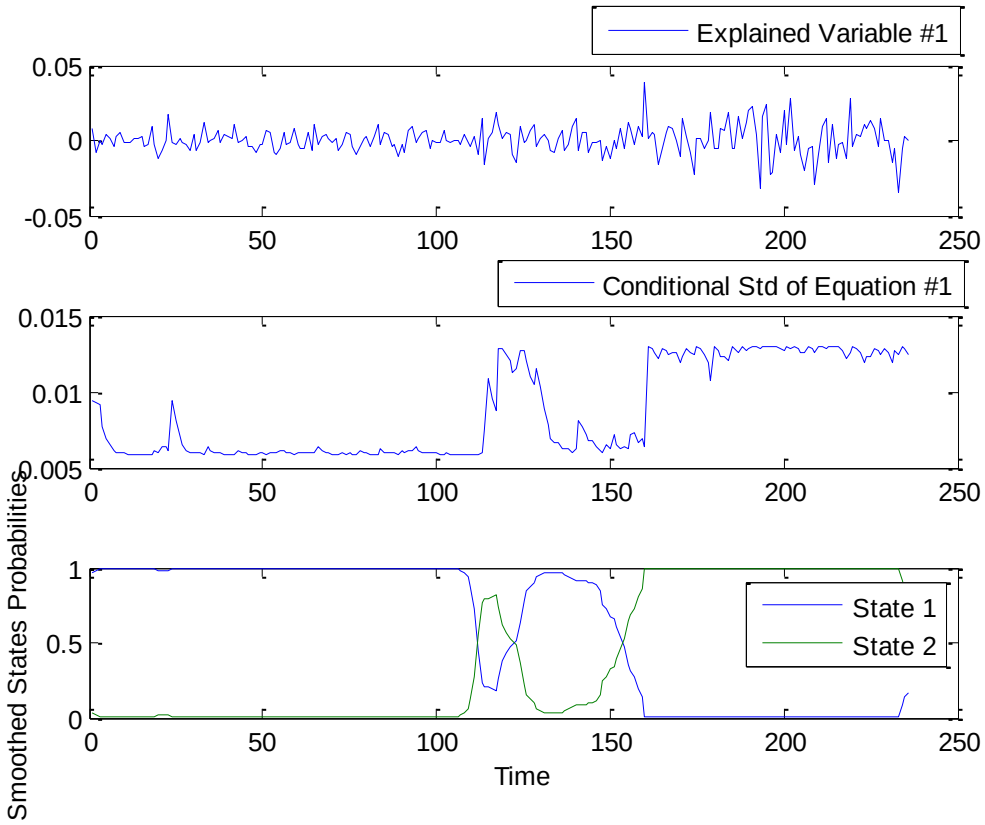
Transition Probabilities Matrix (std. error, p-value)
0.94 (0.00,0.00) 0.02 (0.00,0.00)
0.06 (0.00,0.00) 0.98 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 16.64 time periods
Expected duration of Regime #2: 48.34 time periods



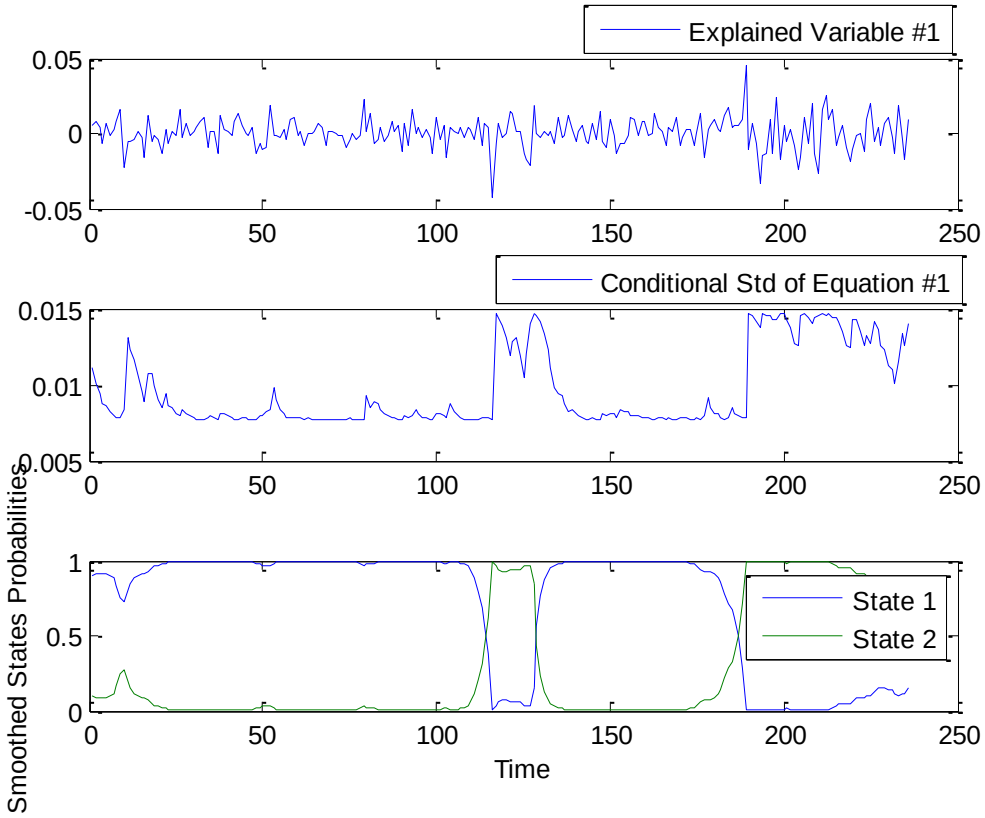
ICBC

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000032
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000172
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0000
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0011
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.01 (0.00,0.00)
0.01 (0.00,0.00) 0.99 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 73.08 time periods
Expected duration of Regime #2: 79.56 time periods



Jiangsu expressway

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000055
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000222
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0008
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0011
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.98 (0.00,0.00) 0.03 (0.00,0.00)
0.02 (0.00,0.00) 0.97 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 62.42 time periods
Expected duration of Regime #2: 33.58 time periods

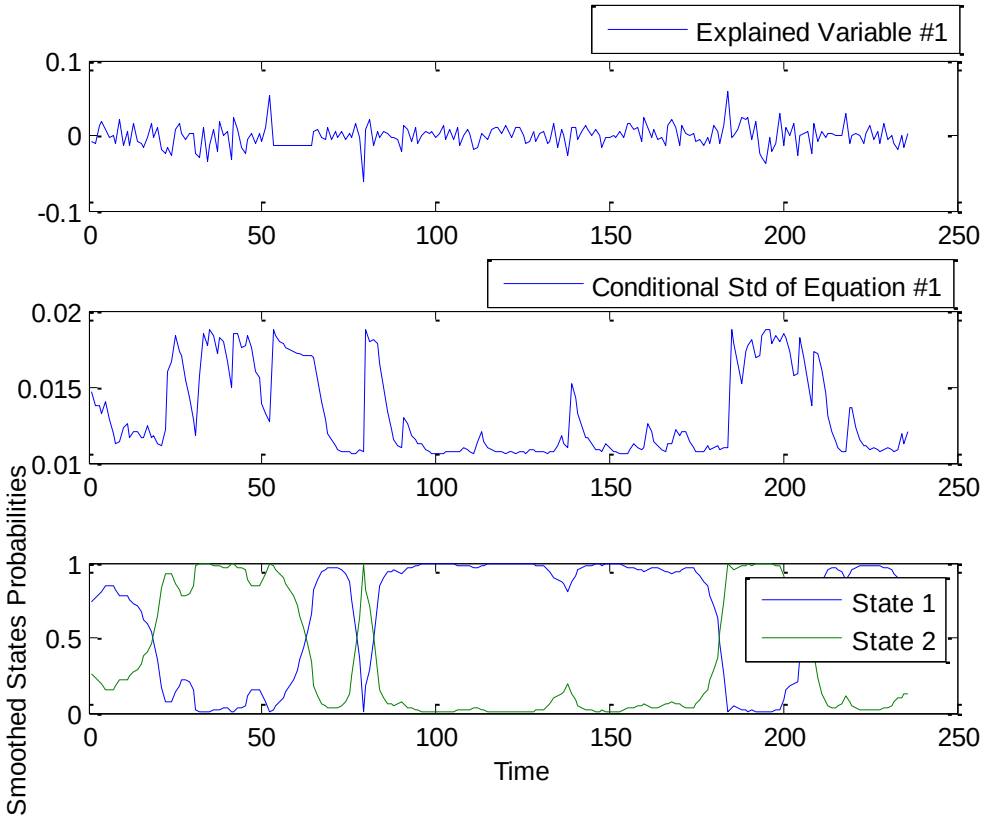


Jiangwei Textile

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000100
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000374
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1

State 1
Value: 0.0006
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0031
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.06 (0.00,0.00)
0.03 (0.00,0.00) 0.94 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 32.84 time periods
Expected duration of Regime #2: 16.27 time periods

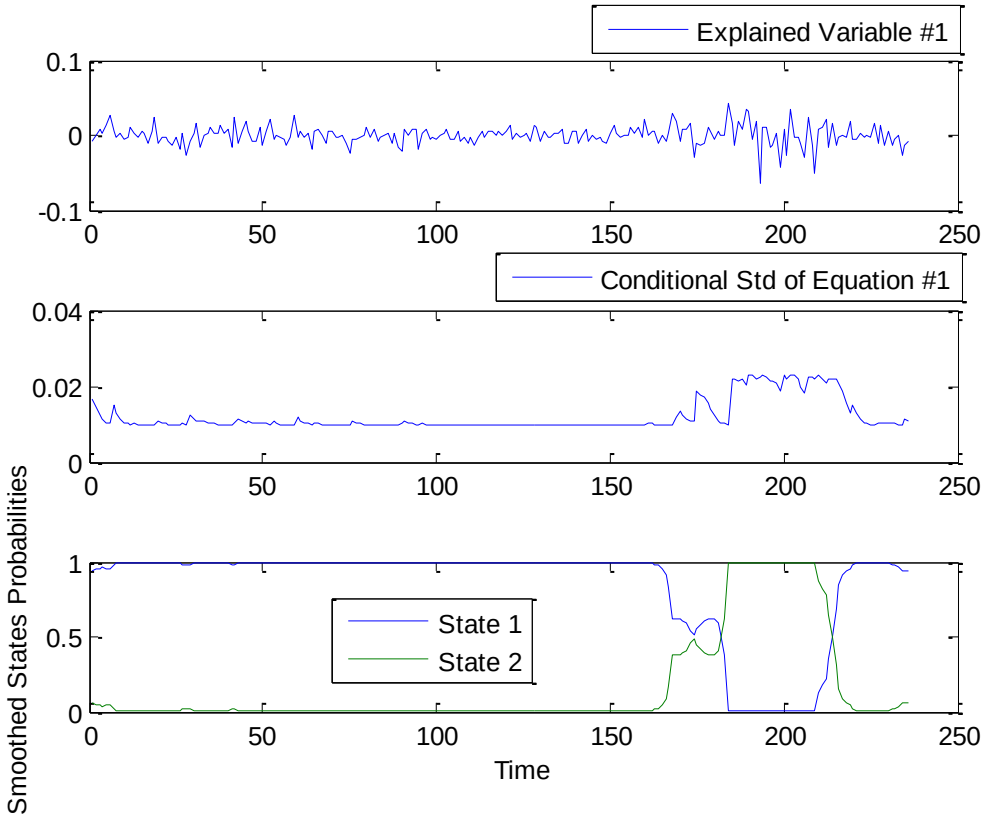


Jiangxi Copper

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000094
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000542
Std Error (p. value): 0.0000 (0.00)

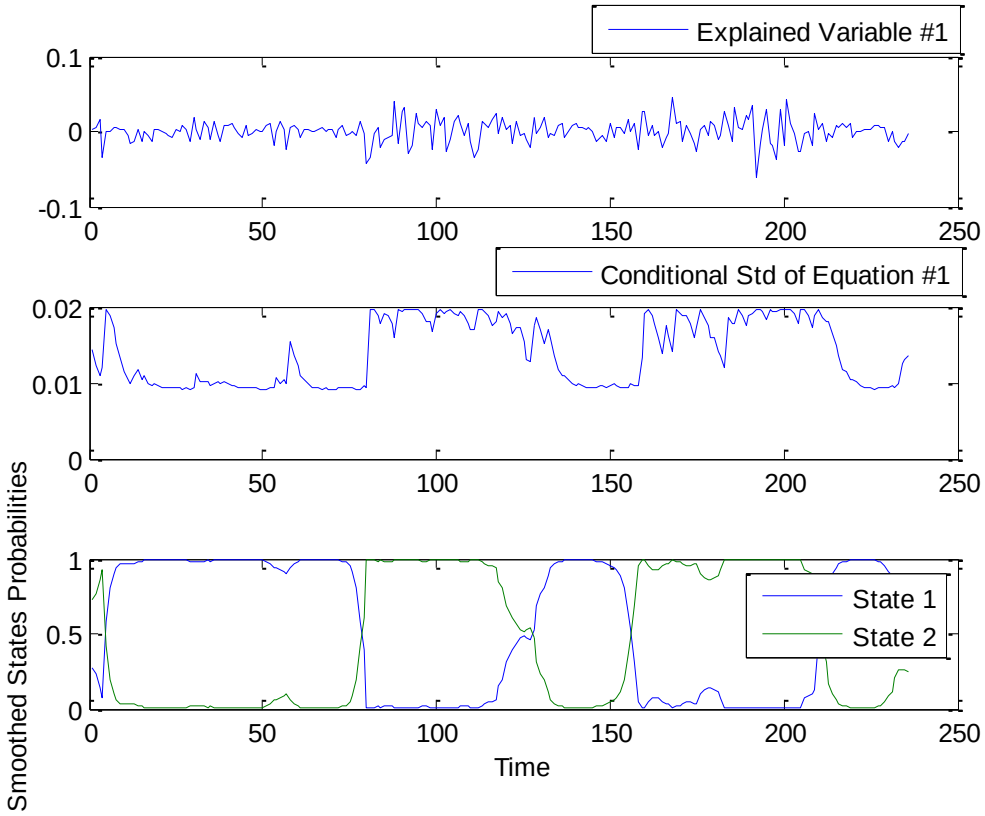
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0002
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.99 (0.00,0.00) 0.04 (0.00,0.00)
0.01 (0.00,0.00) 0.96 (0.00,0.00)

Expected Duration of Regimes
Expected duration of Regime #1: 142.60 time periods
Expected duration of Regime #2: 27.09 time periods



Luoyang Glass

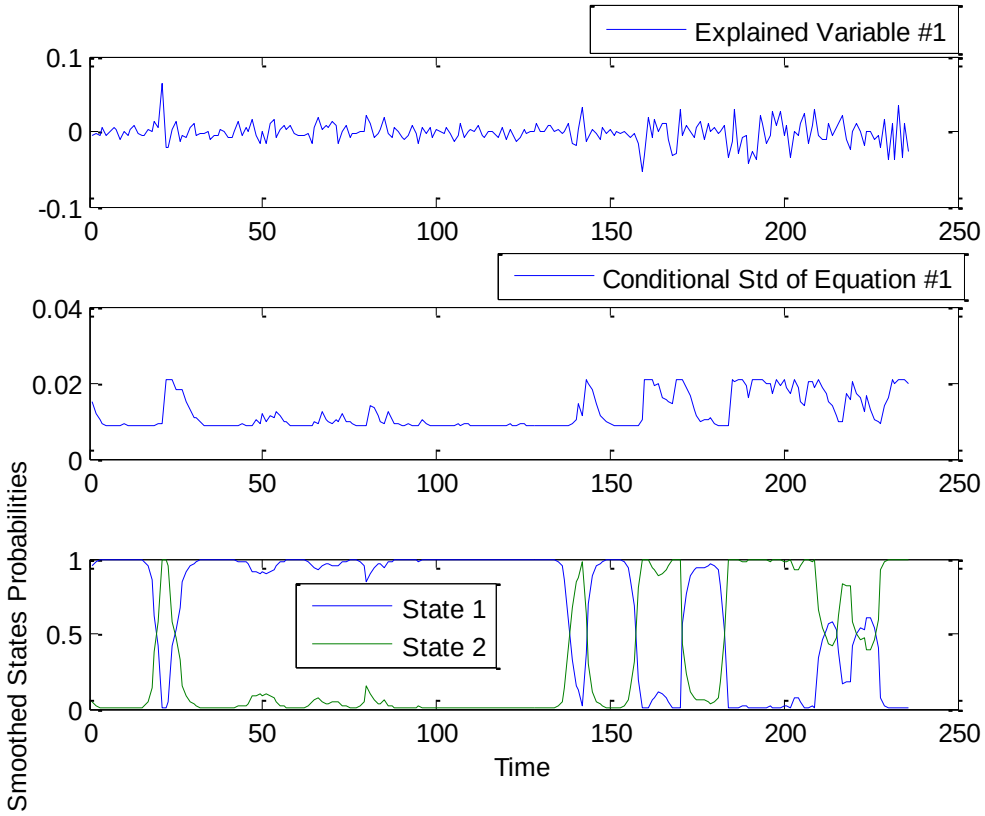
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000075
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000402
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0006
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.04 (0.00,0.00)
0.03 (0.00,0.00) 0.96 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 38.08 time periods
Expected duration of Regime #2: 28.24 time periods



North East Electric

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000059
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000486
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0007
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0032
Std Error (p. value): 0.0000 (0.00)

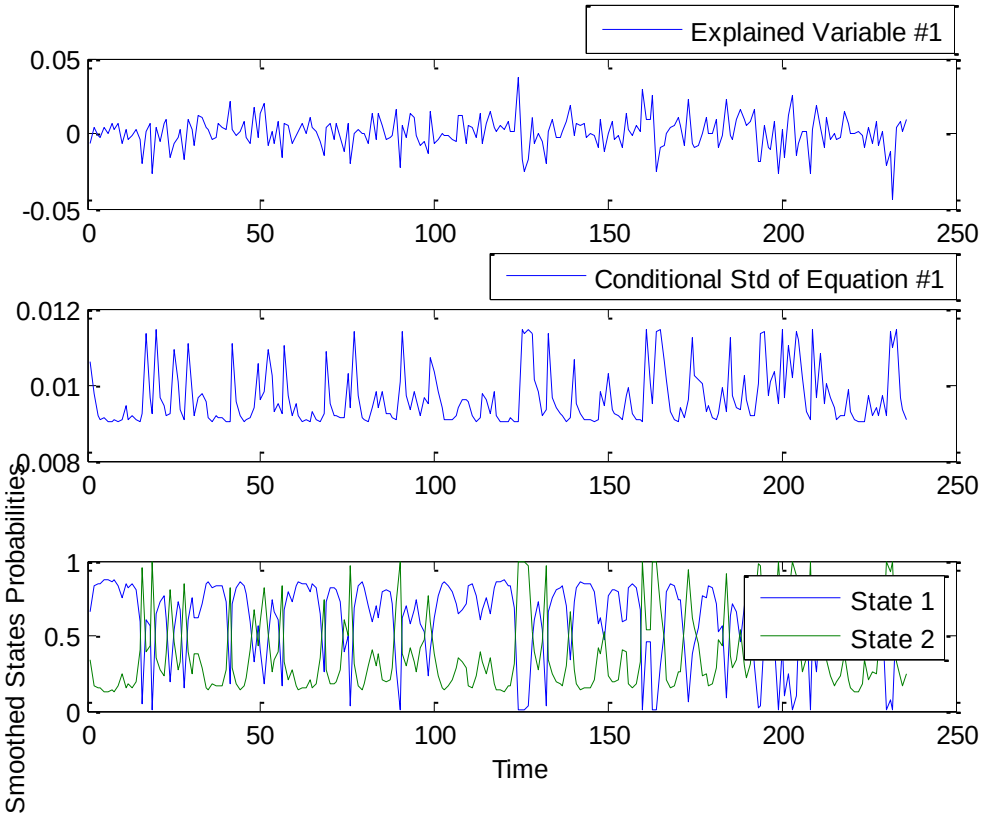
Transition Probabilities Matrix (std. error, p-value)
0.96 (0.00,0.00) 0.08 (0.00,0.00)
0.04 (0.00,0.00) 0.92 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 25.27 time periods
Expected duration of Regime #2: 12.87 time periods



Shangdong Chenming

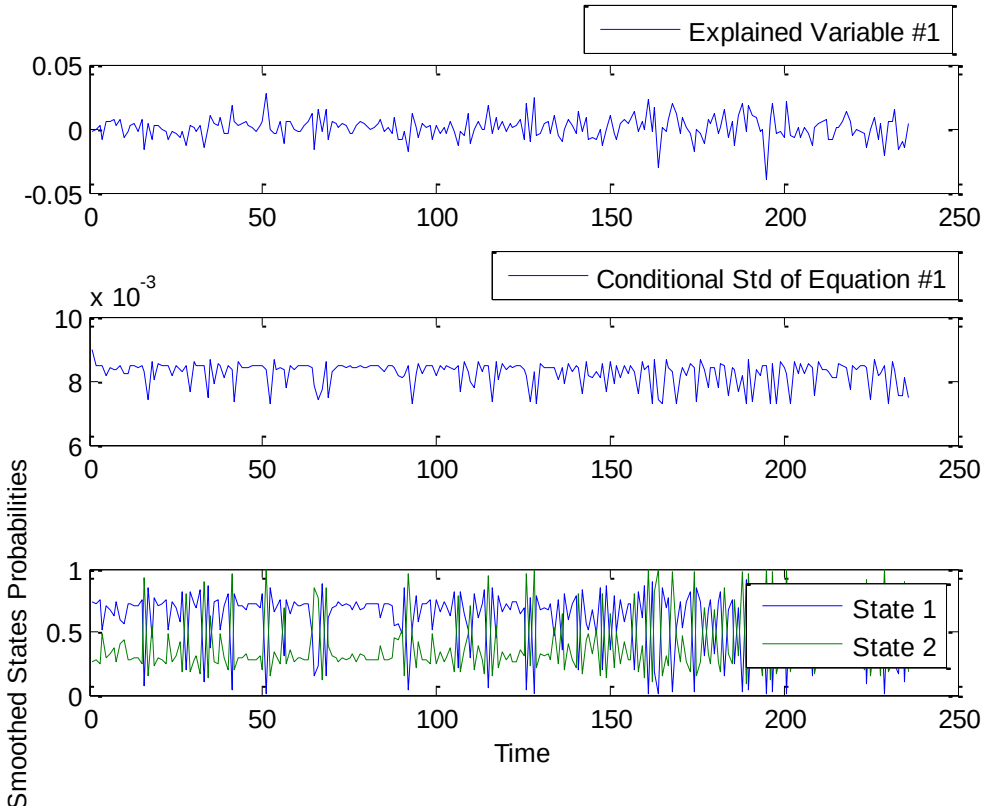
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000042
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000218
Std Error (p. value): 0.0000 (0.00)

Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0018
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0013
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.75 (0.00,0.00) 0.40 (0.00,0.00)
0.25 (0.00,0.00) 0.60 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 4.01 time periods
Expected duration of Regime #2: 2.51 time periods



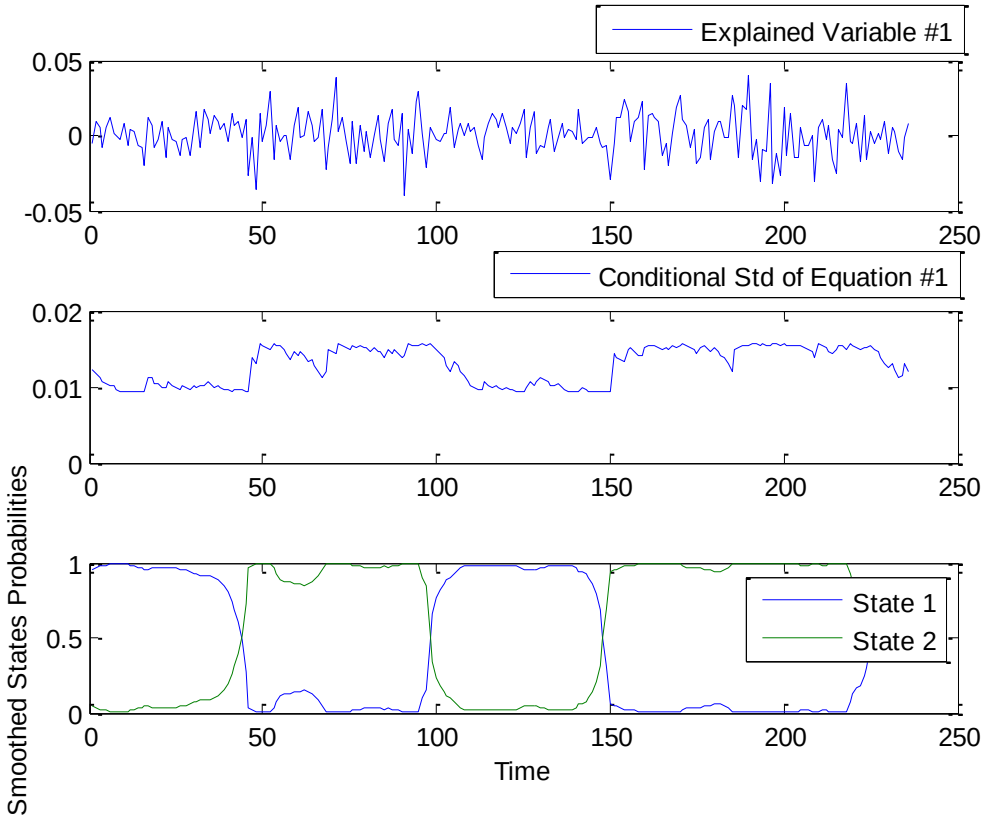
Shangdong Pharmaceutical

State 1
Model's Variance: 0.000030
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000155
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0004
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0008
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.51 (0.00,0.00) 0.75 (0.00,0.00)
0.49 (0.00,0.00) 0.25 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 2.06 time periods
Expected duration of Regime #2: 1.34 time periods



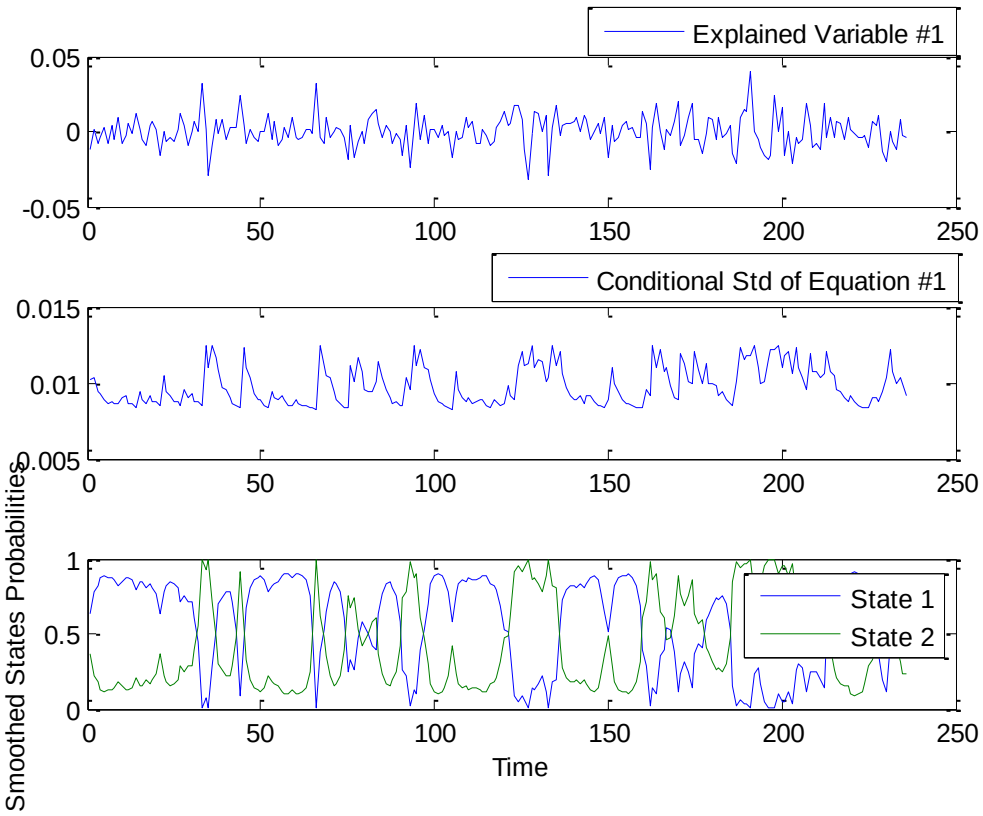
Shengjing

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000076
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000247
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0014
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0005
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.97 (0.00,0.00) 0.02 (0.00,0.00)
0.03 (0.00,0.00) 0.98 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 35.50 time periods
Expected duration of Regime #2: 54.26 time periods



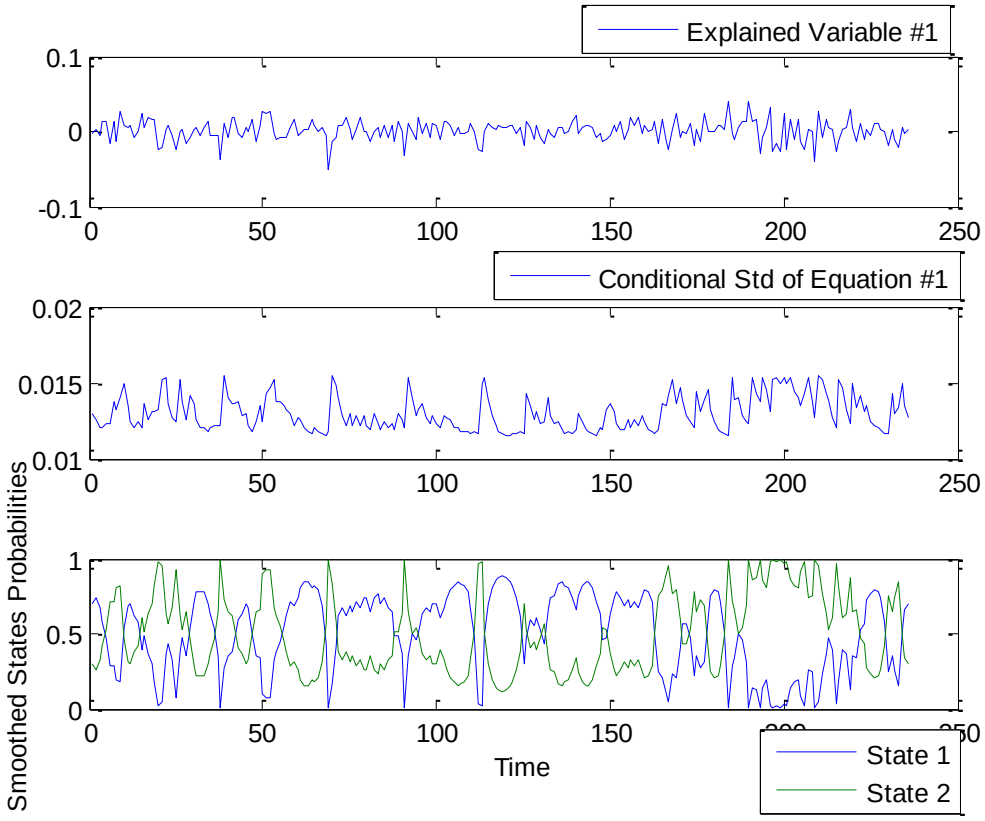
Shenzhen Expressway

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000045
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000188
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: -0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0002
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.87 (0.00,0.00) 0.18 (0.00,0.00)
0.13 (0.00,0.00) 0.82 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 7.45 time periods
Expected duration of Regime #2: 5.64 time periods



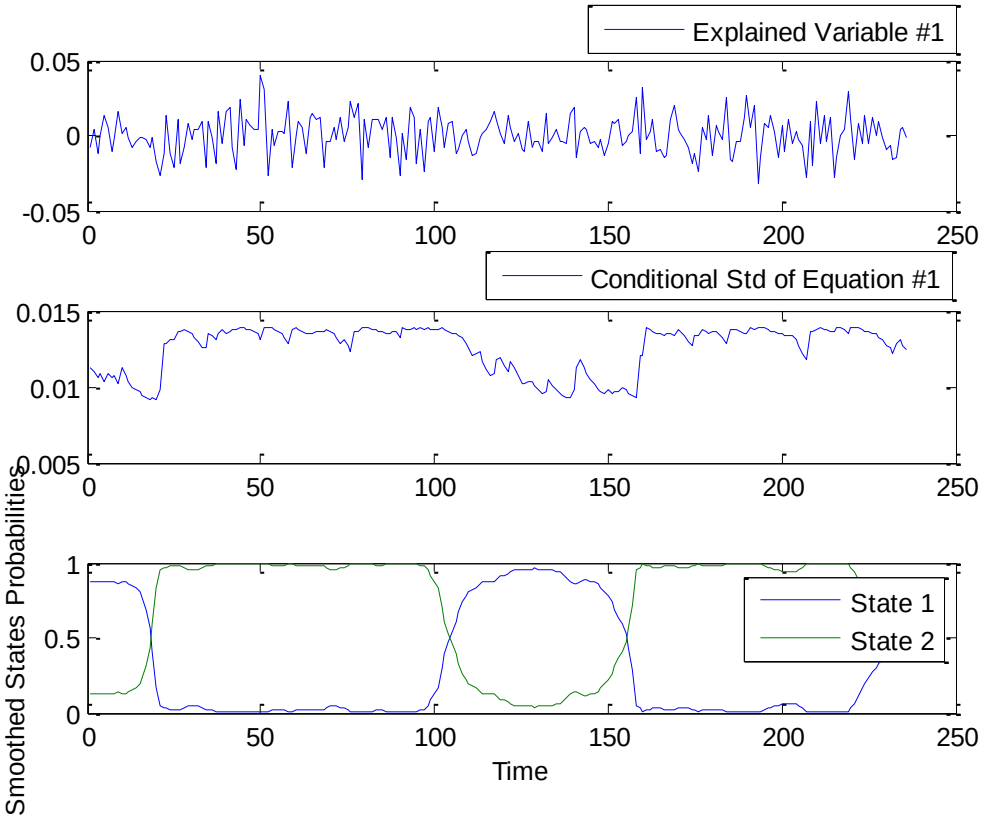
SINOPEC CHEMICAL

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000079
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000292
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0027
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0007
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.80 (0.00,0.00) 0.20 (0.00,0.00)
0.20 (0.00,0.00) 0.80 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 4.92 time periods
Expected duration of Regime #2: 4.88 time periods



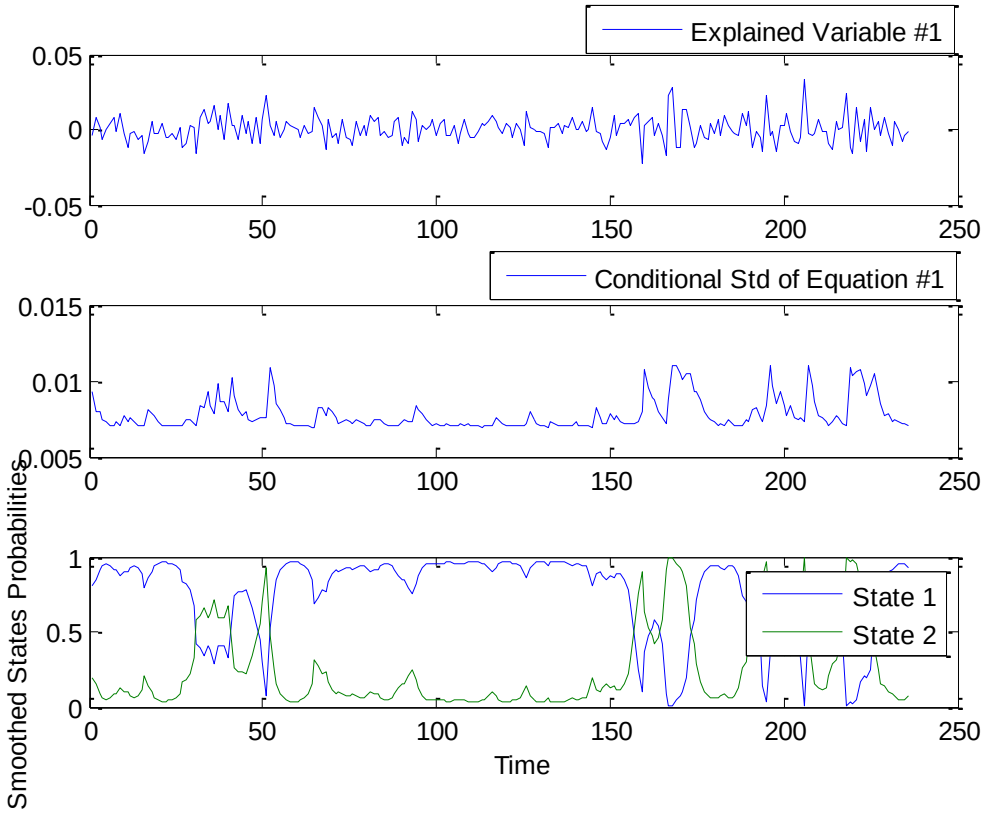
SINOPEC SHANGHAI

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000073
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000195
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0005
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.96 (0.00,0.00) 0.01 (0.00,0.00)
0.04 (0.00,0.00) 0.99 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 26.16 time periods
Expected duration of Regime #2: 77.05 time periods



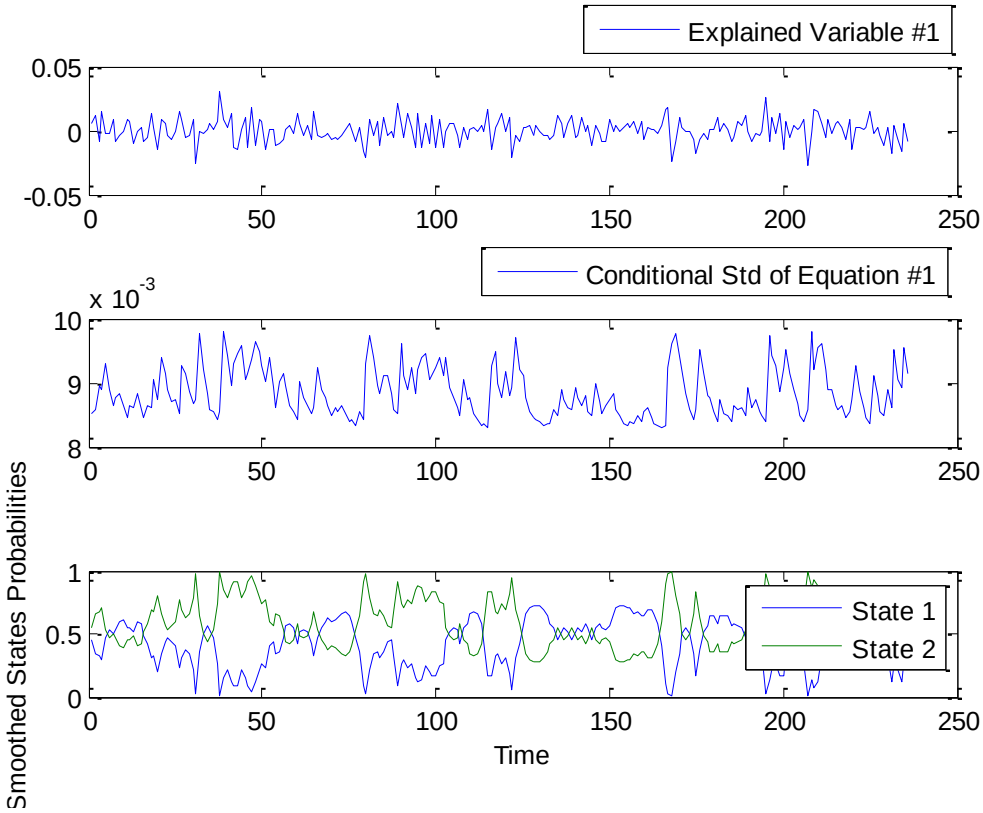
Tianjin Capital

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000040
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000148
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0003
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0020
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.94 (0.00,0.00) 0.19 (0.00,0.00)
0.06 (0.00,0.00) 0.81 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 15.79 time periods
Expected duration of Regime #2: 5.22 time periods



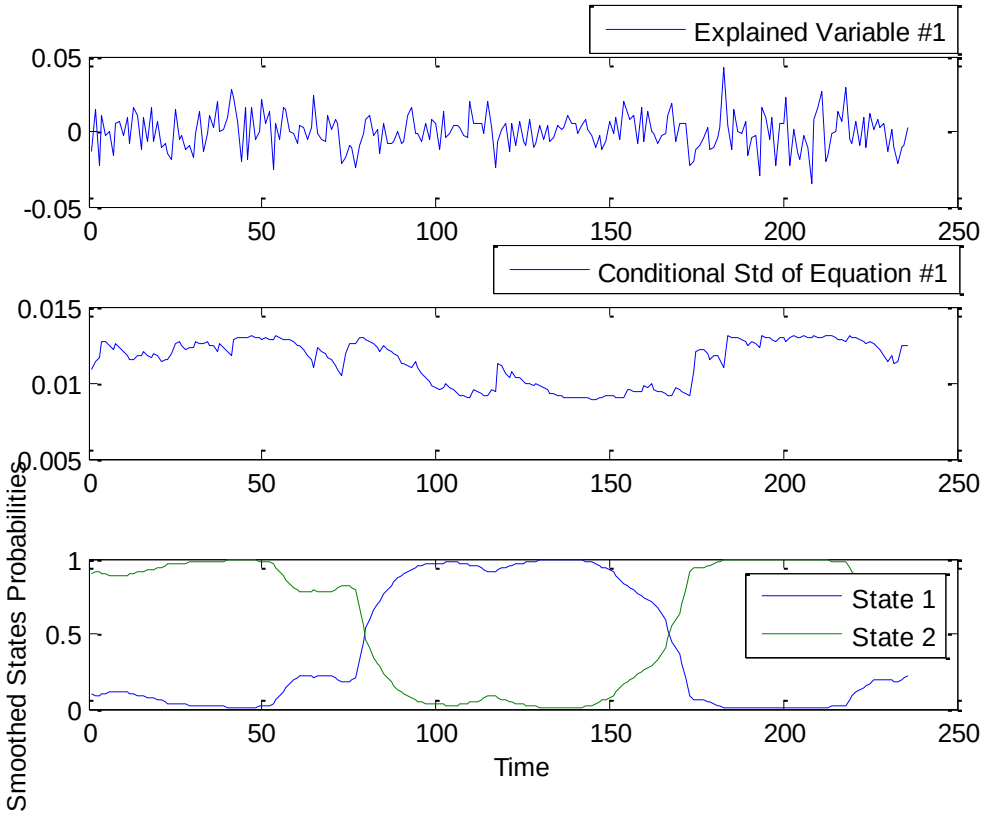
Tsingtao

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000043
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000110
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0001
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0001
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.75 (0.00,0.00) 0.18 (0.00,0.00)
0.25 (0.00,0.00) 0.82 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 4.08 time periods
Expected duration of Regime #2: 5.65 time periods



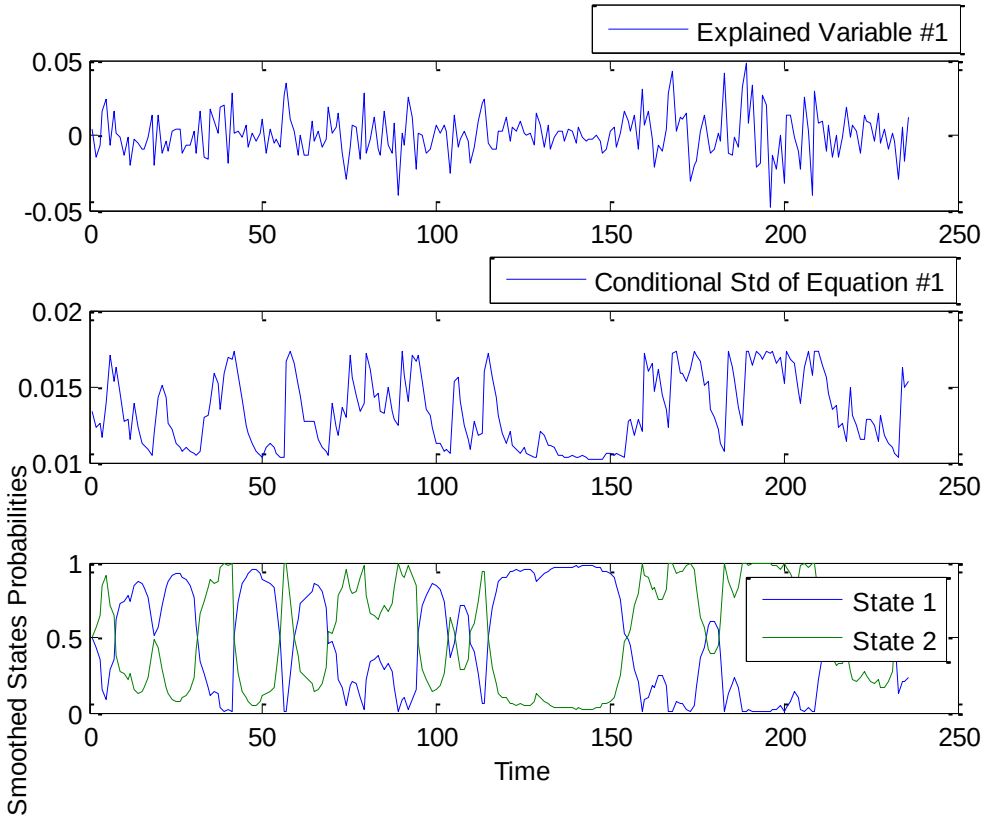
Weichai Power

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000075
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000173
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1
State 1
Value: 0.0005
Std Error (p. value): 0.0000 (0.00)
State 2
Value: -0.0005
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.98 (0.00,0.00) 0.01 (0.00,0.00)
0.02 (0.00,0.00) 0.99 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 55.95 time periods
Expected duration of Regime #2: 82.42 time periods



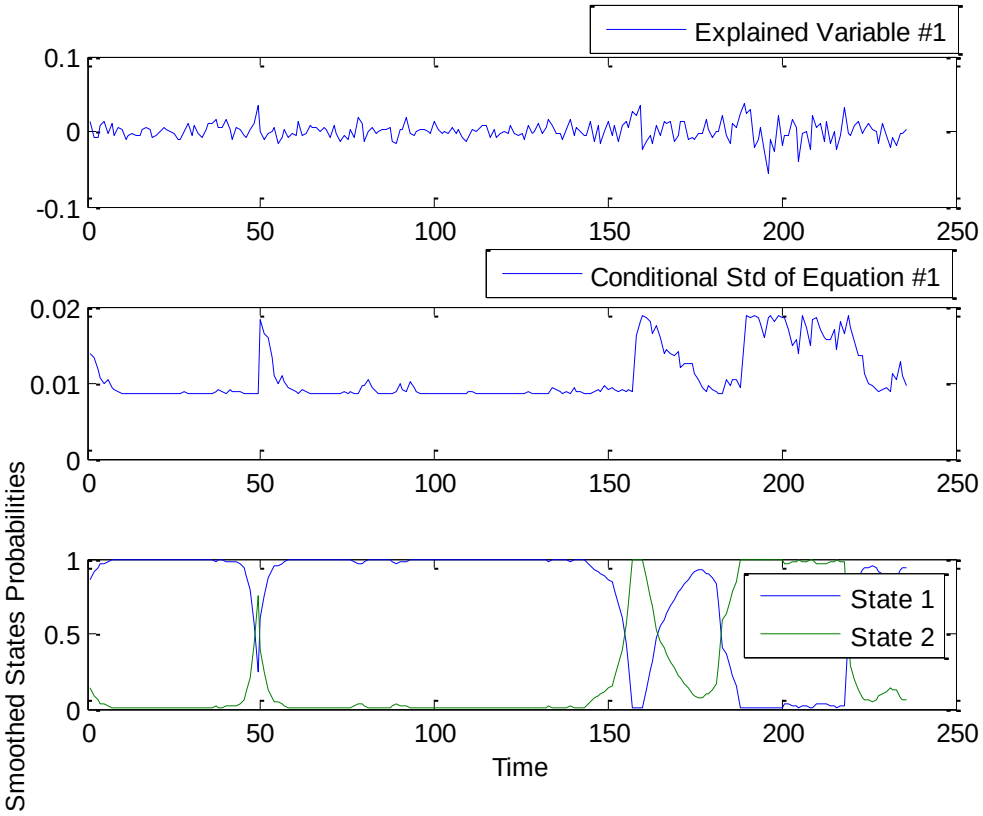
Yanzhou

Non Switching Parameters
Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000071
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000338
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: -0.0012
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0017
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.89 (0.00,0.00) 0.11 (0.00,0.00)
0.11 (0.00,0.00) 0.89 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 9.38 time periods
Expected duration of Regime #2: 9.45 time periods



Zijing Mining

Switching Parameters (Distribution Parameters)
State 1
Model's Variance: 0.000066
Std Error (p. value): 0.0000 (0.00)
State 2
Model's Variance: 0.000380
Std Error (p. value): 0.0000 (0.00)
Switching Parameters (Regressors)
Switching Parameters for Equation #1 - Indep column 1
State 1
Value: 0.0002
Std Error (p. value): 0.0000 (0.00)
State 2
Value: 0.0004
Std Error (p. value): 0.0000 (0.00)
Transition Probabilities Matrix (std. error, p-value)
0.98 (0.00,0.00) 0.07 (0.00,0.00)
0.02 (0.00,0.00) 0.93 (0.00,0.00)
Expected Duration of Regimes
Expected duration of Regime #1: 53.17 time periods
Expected duration of Regime #2: 15.12 time periods


Explained Variable #1
0.1
0
-0.1
0
50
100
150
200
250
Conditional Std of Equation #1
0.02
0.01
0
Smoothed States Probabilities
1
0.5
State 1
State 2
Time

Appendix 8 –CIMC Cash option (extract from company website)

CIMC Cash option – Directly taken from the company web site-
Please note that some sections have been deleted from simplicity purposes.

"China International Marine Containers (Group) Co., Ltd.

Announcement on B-share Cash Option Implementation PlanRegarding Listing Location Change and Listing & Trading of Domestically Listed Foreign Shares on the Main Board of the Stock Exchange of Hong Kong Limited through Introduction

China International Marine Containers (Group) Co., Ltd. (hereinafter referred to as "the Company") and all members of its Board of Directors hereby ensure that this announcement is factual, accurate and complete without any false information, misleading statement or material omission. And the English translation is for reference only.

Special notes:

1. On 28 Nov. 2012, the Company obtained the approval papers from the Listing Committee of the Stock Exchange of Hong Kong Limited (SEHK) regarding it conditionally approving in principle the Company's application for listing location change and listing & trading of domestically listed foreign shares on the main board of SEHK through introduction. Upon application, trading of the Company's B-shares will be suspended since 30 Nov. 2012. The trading day before the suspension, i.e. 29 Nov. 2012, is the last trading day for the Company's B-shares. Afterwards, the cash option distribution, exercise application, clearing and settlement for the B-shares will start. And trading of the B-shares will stop.

2. This announcement only explains the specific operating procedure for the

Company's B-share holders to apply for exercising cash options and other relevant matters. It is not giving advice on whether to apply for exercising the cash options or not. Investors are kindly reminded to pay attention to possible investment risks. The Company disclosed on 19 Nov. 2012 the "Suggestive Announcement on the B-share Cash Option Implementation of China International Marine Containers (Group) Co., Ltd.". Should there be any discrepancy between the announcement on 19 Nov. 2012 and this announcement, this announcement shall prevail.

3. Investors shall apply for exercising cash options via their B-share securities accounts. For an investor with more than one B-share accounts, he/she shall apply separately for every of his/her B-share accounts. For an investor holding CIMC B-shares in more than one operating units under one B-share account, he/she shall apply separately for the B-shares held in different operating units.

4. As for B-share holders or relevant obligees with judicially frozen B-shares, and shareholders or obligees whose B-shares are pledged or judicially frozen due to various reasons before the cash option implementation date, they should handle the said shares in a timely and legal manner.

On 30 Aug. 2012, the Company convened the Third Special Shareholders' General Meeting for 2012, at which the Proposal on the Plan Regarding Listing Location Change and Listing & Trading of Domestically Listed Foreign Shares on Main Market of the Stock Exchange of Hong Kong Limited through Introduction was reviewed and approved. The Company has submitted to China Securities Regulatory Commission (CSRC) the application for listing location change and listing & trading of domestically listed foreign shares on the main market of the Stock Exchange of Hong Kong Limited through introduction, and received on 24 Oct. 2012 the CSRC

Notice of Accepting the Administrative Permit Application for Review (No. 121896).

The Company submitted on 26 Oct. 2012 to the Stock Exchange of Hong Kong Limited (SEHK) the A1 Submission regarding listing location change and listing & trading of domestically listed foreign shares on main market of SEHK through introduction, and received the SEHK acceptance letter on 31 Oct. 2012.

On 20 Nov. 2012, the Company received from China Securities Regulatory Commission (CSRC) the "Reply on Approving China International Marine Containers (Group) Co., Ltd. to Go Public on the Main Board of SEHK (Zheng-Jian-Xu-Ke [2012] No. 1548)" for the Company's application for listing location change and listing & trading of its domestically listed foreign shares on the main board of the Stock Exchange of Hong Kong Limited (SEHK) through introduction. On 28 Nov. 2012, the Company obtained the approval papers from the Listing Committee of the Stock Exchange of Hong Kong Limited (SEHK) regarding it conditionally approving in principle the Company's application for listing location change and listing & trading of domestically listed foreign shares on the main board of SEHK through introduction.

Upon application, trading of the Company's B-shares will be suspended since 30 Nov. 2012. The trading day before the suspension, i.e. 29 Nov. 2012, is the last trading day for the Company's B-shares. Afterwards, the cash option distribution, exercise application, clearing and settlement for the B-shares will start. And trading of the B-shares will stop. When the cash option exercise completes, the Company will apply to Shenzhen Stock Exchange for removal of its B-shares from the system of SD&C.

After it receives the official approval letter from SEHK for the Company's H-share listing, the relevant shares will be listed and traded in the form of H-shares on the main board of SEHK.

The Company will provide, by means of application via the trading system of

Shenzhen Stock Exchange or manual application, B-share cash options for all its B-share holders, among which China Merchants (CIMC) Investment Limited, COSCO Container Industries Limited and its related enterprise Long Honour Investments Limited have promised to give up their rights to exercise cash options and directors, supervisors and senior executives holding restricted shares cannot exercise cash options. Relevant matters are hereby announced as follows:

Important Contents

1. On 28 Nov. 2012, the Company obtained the approval papers from the Listing Committee of the Stock Exchange of Hong Kong Limited (SEHK) regarding it conditionally approving in principle the Company's application for listing location change and listing & trading of domestically listed foreign shares on the main board of SEHK through introduction. Upon application, trading of the Company's B-shares will be suspended since 30 Nov. 2012. The trading day before the suspension, i.e. 29 Nov. 2012, is the last trading day for the Company's B-shares. After 4 Dec. 2012, the date of record and the date when the clearing and delivery for the last trading day—29 Nov. 2012—before the B-share trading suspension complete, all B-share holders of the Company other than China Merchants (CIMC) Investment Limited, COSCO Container Industries Limited and its related enterprise Long Honour Investments Limited, as well as directors, supervisors and senior executives holding restricted shares, have the rights to exercise cash options. Among B-share holders, China Merchants (CIMC) Investment Limited, COSCO Container Industries Limited and its related enterprise Long Honour Investments Limited have promised to give up their rights to exercise cash options and directors, supervisors and senior executives holding restricted shares cannot exercise cash options.

According to the Proposal on the Plan Regarding Listing Location Change and Listing

& Trading of the Company's Domestically Listed Foreign Shares on Main Market of the Stock Exchange of Hong Kong Limited through Introduction, which was reviewed and approved at the Third Special Shareholders' General Meeting for 2012 of the Company, the Company's A-share holders DO NOT have cash options.

2. The cash option exercise price for the B-shares is HKD 9.83/share. Exercising the cash option means investors selling out the Company's B-shares at the price of HKD 9.83/share. Investors are kindly reminded to be aware of possible risks arising from exercising the cash option.

3. The date of record for the B-share cash options is 4 Dec. 2012 (the date when the Shenzhen branch of China Securities Depository and Clearing Co., Ltd. completes clearing and delivery after the last trading day—29 Nov. 2012—closes). The application period is 9:30 a.m.—11:30 a.m. and 1:00 p.m.—3:00 p.m. on every trading day from 5 Dec. 2012 to 11 Dec. 2012, with the deadline at 3:00 p.m. on 11 Dec. 2012. For manual application, the application materials must be delivered or signed upon arrival by mail before the said deadline for application. During the application period, trading of the Company's B-shares will be suspended.

4. B-share holders who trust the Company's B-shares with domestic securities companies can conduct cash option application and exercise via the trading system of Shenzhen Stock Exchange. For those B-share holders who DO NOT trust the Company's B-shares with domestic securities companies, they shall conduct cash option application and exercise manually upon application to the issuer according to the "Guidelines for Cash Option Operations of Shenzhen Stock Exchange (Revised in 2011)".

There is no precedent in China's capital market for this B-share cash option implementation. According to the Notice on Doing a Good Job in Technical

Preparations Regarding B-share Cash Options released by Shenzhen Stock Exchange on 17 Sept. 2012, for any B-share holder who chooses to exercise B-share cash options via domestic securities companies, the exercise and application ways are the same with the ways for A-share cash options.

Whether an investor chooses to apply for exercising cash options via the trading system of Shenzhen Stock Exchange or via manual application upon application to the issuer, he/she shall apply for exercising cash options via his/her B-share securities account. For an investor with more than one B-share accounts, he/she shall apply separately for every of his/her B-share accounts. For an investor holding CIMC B-shares in more than one operating units under one B-share account, he/she shall apply separately for the B-shares held in different operating units.

5. The applicable rules for implementation of the cash options are the "Guidelines for Cash Option Operations of Shenzhen Stock Exchange (Revised in 2011)", the "Guidelines of the Shenzhen Branch of China Securities Depository and Clearing Co., Ltd. for Cash Option Operations of Listed Companies" and the "Supplementary Notification on B-share Cash Option Operations".

6. If any B-share holder has any behavior that may lead to change of the trustee unit of the B-share holder's securities account (the operating division of a securities company) such as transferring the trusteeship during the period from the cash option distribution date to the application deadline for the cash options, he/she may not be able to apply for exercising his/her cash options via the trading system of Shenzhen Stock Exchange. Therefore, B-share holders are particularly advised not to transfer the trusteeship or conduct any other behavior that may lead to change of the trustee unit of their securities accounts (the operating division of a securities company) during the said period. If any B-share holder has any behavior that may lead to change

of the trustee unit of the B-share holder's securities account (the operating division of a securities company) such as transferring the trusteeship during the said period, he/she must apply for exercising cash options via the Company's manual application.

7. This announcement only explains the specific operating procedure for the Company's B-share holders to apply for exercising cash options and other relevant matters. It is not giving advice on whether to apply for exercising the cash options or not. Investors are kindly reminded to pay attention to possible investment risks. The Company disclosed on 19 Nov. 2012 the "Suggestive Announcement on the B-share Cash Option Implementation of China International Marine Containers (Group) Co., Ltd.". Should there be any discrepancy between the announcement on 19 Nov. 2012 and this announcement, this announcement shall prevail. For details about the listing location change and listing & trading of domestically listed foreign shares on main market of the Stock Exchange of Hong Kong Limited through introduction, please read the Plan for Listing Location Change and Listing & Trading on Main Market of The Stock Exchange Of Hong Kong Limited through Introduction of Domestic listed foreign Investment Shares of China International Marine Containers (Group) Co., Ltd. and relevant documents disclosed on www.cninfo.com.cn and www.szse.cn on 15 Aug. 2012, as well as relevant announcements to be disclosed by the Company.

I. Explanation

In this announcement, the abbreviations on the left column refer to items on the right column unless otherwise specified. CIMC, the Company, the Listed Company refer to China International Marine Containers (Group) Co., Ltd. CIMC B-shares, B-shares refer To Domestically listed foreign shares issued by

CIMCH-shares refers To Overseas listed foreign shares listed in Hong

Kong China Merchants (CIMC) Investment refers to China Merchants (CIMC) Investment Limited COSCO refers to COSCO Container Industries Limited

Long Honour refers to Long Honour Investments Limited The Shenzhen branch of SD&C refers to The Shenzhen branch of China Securities Depository and Clearing Co., Ltd. SEHK refers to the Stock Exchange of Hong Kong Limited

II. Shareholders eligible to apply for exercising the cash options

After 4 Dec. 2012, the date of record and the date when the clearing and delivery for the last trading day—29 Nov. 2012—before the B-share trading suspension complete, all B-share holders of the Company other than China Merchants (CIMC) Investment Limited, COSCO Container Industries Limited and its related enterprise Long Honour Investments Limited that have promised to give up their rights to exercise cash options, as well as directors, supervisors and senior executives holding restricted shares, can apply for exercising cash options according to this announcement.

Where a shareholder succeeds in applying for exercising cash options, a third party will pay the cash consideration to the shareholder and obtain the corresponding B-shares of the Company.

According to the Proposal on the Plan Regarding Listing Location Change and Listing & Trading of the Company's Domestically Listed Foreign Shares on Main Market of the Stock Exchange of Hong Kong Limited through Introduction, which was reviewed and approved at the Third Special Shareholders' General Meeting for 2012 of the Company, the Company's A-share holders DO NOT have cash options.

III. Basic terms for the cash option

(I) Code and abbreviation for the cash option

Code: 238001

Abbreviation: ZJP1

(II) Target securities of the cash option

Code of target securities: 200039

Short name of target securities: ZJB

(III) Distribution method of cash option

Free of charge.

(IV) Arrangement for listing of cash option

Not for listing.

(V) Distribution proportion of cash option

B-share holders of the Company will be granted a cash option for each share of B-share. The minimum unit of stock for the application of cash option is 1 share.

(VI) Exercise proportion of cash option

Holder of relevant rights is entitled to sell 1 share of CIMC B-share to the third-party for holding of an above mentioned right.

(VII) Exercise price of cash option

Exercise price of cash option is of HKD 9.83 per share.

(VIII) Distribution of cash option

If the securities account of an B-share holder is trusted in two or more than two trading units (operations department of securities companies) on the date of record for the cash options (4 Dec. 2012), and all with holding of B shares of the Company, then the distribution is carried out by specific number of each trading unit of the mentioned B shares holder on the registration date, sorted by size of holding and in turn. The distribution will be complete when the amount of distribution is equal to the cash option enjoyed by the mentioned B-share holder.

(IX) Measurement of the amount of cash option

The third party will provide cash options to all CIMC B-share holders that after the clearance and delivery at the last trading date before final suspension of CIMC B shares, of which China Merchants (CIMC) Investment Limited, COSCO and its affiliated enterprise Long Honour have made commitment on renouncing the exercise of capital option. Moreover, directors, supervisors as well as senor management will not be able to exercise cash option.

(X) Application period of cash option

The application period of this B shares cash option will be 9:30—11:30 a.m. and 1:00—3:00 p.m. from 5 Dec. 2012 to 11 Dec. 2012, and the expiration time will be on 3:00 p.m. of 11 Dec. 2012. In terms of manual application, the transport time or the arrival and sign in of post materials can be up to the expiration time of the application period.

(XI) Performance guarantee of cash option

Before the distribution of cash option, the third party will provide performance guarantee by offering cash via a specific account and maintain sufficient amount of cash.

(XII) Settlement method of cash option

Cash option will be settled by delivery of securities, that means when a holder of cash option exercises, he/she shall deliver B shares of the Company at the same time as well as obtain relevant exercise price from the third-party. With the success of exercising 1 cash option by a B-share holder, the system will deduct 1 cash option right and 1 share of CIMC B-share. In the meantime, the shareholders' cash account will acquire HKD 9.83 and deduct certain cash for relevant stock trading tax. The exchange rate of Hong Kong dollar shall be determined by middle price of exchange rate disclosed by People's Bank of China on the exercise and clearance date of cash

option.

(XIII) Arrangement of matured unexercised right

Cash options that fail to make application and exercise will be cancelled after the application period.

IV. Application method for exercise of cash option

(I) Shareholders who trusts B shares of the Company in domestic security companies will be able to carry out application and exercise via the trading system of Shenzhen Stock Exchange

1. Exercise orders

Investors shall apply for exercising cash options via their B-share securities accounts. For an investor with more than one B-share accounts, he/she shall apply separately for every of his/her B-share accounts. For an investor holding CIMC B-shares in more than one operating units under one B-share account, he/she shall apply separately for the B-shares held in different operating units.

In accordance with notes of technology system of relevant security company and cash deposit in his/her securities account, B-share holders will select an exercise code and then forward an exercise code. Exercise orders including the following content:

Exercise code: 238001

Category of operation: exercise

Entrust number: the number of B-share cash option

Entrust price: HKD 9.83/share (exercise price)

Application is carried out with exercise order as the unit. The exercise order is efficient that very day and is able to cancel that very day.

2. Issues for confirmation before the exercise

(1) The qualified B-share holders can choose to exercise their cash options totally or

partially. During the application period of cash options, the tradable share holders, who have applied for exercising their cash options and it is confirmed as valid by China Securities Depository and Clearing Corporation Limited Shenzhen Branch, shall not withdraw the applied cash options totally or partially.

(2) Before the issuance of exercise orders, the B-share holders shall confirm that the entrusted amount of exercise orders doesn't exceed the amount of cash options in their securities account that under the custody of this operation units and there are sufficient CIMC B shares in their securities account. If the holders of frozen or pledged shares intend to exercise their cash options, they shall release such freeze or pledge before the application. If the holders of frozen or pledged shares plan to exercise their cash options, they shall release such freeze or pledge before the application. If the amount of cash options applied to exercise by B-share holders exceeds the amount of unfrozen or unpledged shares actually held in their securities account that under the custody of this operation units, such exercise entrust fails; otherwise the former will be the effective application amount.

(3) Confirmation on the effective amount of multiple-applied shares

As for the multiple application of cash option with the same securities account and application code of cash option during the application period, Shenzhen Branch of China Securities Depository and Clearing Corporation Limited will add relevant application numbers according to the sequence of receiving the applications and deal with them in sequence as well as confirm the effective amount of applied shares in accordance with the procedures on applying for exercising the cash options and the stipulations of Article (2) under the provision.

(4) If investors that has exercised cash option on T day pledge his/her holding-for-exercise shares or his/her holding-for-exercise shares was judicial frozen or deducted by force before the close of trading on T+1 day, then there is a possibility that the exercise and delivery will

fail on final delivery time of T+1 day.

In case of B-shares holders fail in exercising cash option, they shall make another application within the exercise application period if they want to exercise.

3. The Company's stock transaction treatment during the exercise period

During the application period, the Company's B-share will stop to trade.

4. Amount of cash options, deduction of shares and acquisition of funds after the exercise

With the success of exercise on T day, exercise capital will record into relevant settlement reserves account automatically on T+1 day; in the meanwhile, it will deduct corresponding amount of cash option rights and CIMC B-share of securities account of B-share holders. Finally, relevant securities company will record relevant exercise capital into capital account of B-share holders.

5. After the expiration of the application, the unexercised cash options in the securities account of B-share holders will be written off.

6. Expenses

The B-share holders are free of charge for exercising cash option or withdrawing application via trading system of stock exchange. The transfer party and the acquisition party shall make payment of relevant taxes in accordance of relevant regulations separately when handle the certificates of stock transfer of exercising cash options and transfer procedure. If the transfer fails due to insufficient expenses, the responsible party shall account for the responsibility.

The exchange rate of Hong

Kong dollar shall be determined by middle price of exchange rate disclosed by

People's Bank of China on the exercise and clearance date of cash option.

(II) Shareholders who didn't trust B-share of the Company in domestic security companies shall conduct manual application and exercise of cash option

1. Application for exercise

Investors shall apply for exercising cash options via their B-share securities accounts. For an investor with more than one B-share accounts, he/she shall apply separately for every of his/her B-share accounts. For an investor holding CIMC B-shares in more than one operating units under one B-share account, he/she shall apply separately for the B-shares held in different operating units.

Shareholders who didn't trust B-share of the Company in domestic security companies shall submit application materials to the Company via transport, post within compulsory application period if they plan to exercise cash option. A shareholder may choose to submit his/her exercise application materials via the overseas securities company he/she deposits his/her shares with; or may choose to submit the materials on his/her own. For contact information of the Company please refer to "VII. For contact" of this announcement. The arrival and sign in of transport or post can be within the valid application period (up until 3:00 p.m. of 11 Dec. 2012).

If there is an insufficiency of application materials, the application is treated as invalid.

In accordance of Guidelines on Cash Option Operations of Listed Companies by China Securities Depository and Clearing Corporation Limited., Shenzhen Branch and Guidelines on Management of Security Accounts by China Securities Depository and Clearing Corporation Limited., Shenzhen Branch of China Securities Depository and Clearing Corporation Limited., Shenzhen Branch, shareholders shall submit the following materials for exercise application:

1) If a shareholder chooses to submit the exercise application materials via the overseas depository securities company, the securities company shall submit the following exercise application materials to the Company:

A. "Confirmation Letter of Investor Applying for Exercise Manually" filled and signed by the B-share holder (see Attachment 1 to this announcement for the format of the Confirmation

Letter), copy of the ID papers of the B-share holder,

"Confirmation Letter" issued by the overseas depository securities company and authenticated by a competent law firm in the place where the securities company belongs (see Attachment 2 to this announcement for the format).

B. Valid ID papers of the overseas depository securities company and their copies

Valid ID papers refer to business registration documents, or documents proving the establishment of the said institution that with the equal legal effect etc..

C. Copies of the legal representative certificate of the overseas depository securities company and the valid identification papers of the legal representative, with the official seal of the institution where the legal representative belongs

The overseas depository securities company must submit papers to prove the identity of the principal of the overseas depository securities company, which include but are not limited to the legal representative certificate, the articles of association or resolutions of the board of directors that state the qualifications of the principal, the registration certificate that states the powers and duties of the principal, etc. (hereinafter referred to as the "Legal Representative Certificates" for convenience of statement).

Subject to different applicants, besides the legal representative of a corporate body, the principal of a depository securities company also includes the proxy appointed by the executive partner of a partnership enterprise or a body, the principal of a non-corporate of a venture capital enterprise, directors and main shareholders of an overseas body, etc. (hereinafter referred to as the "Legal Representative").

D. Legal Representative authorization letter of the overseas depository securities company, with the signature/seal of the Legal Representative and the official seal of the institution, if needed

Where the principal of an overseas depository securities company appoints a proxy, an

authorization letter with the signature/seal of the principal and the official seal of the company must be submitted.

E. Show the originals of the valid identification papers of the operator and submit their copies (if needed)

F. Where the overseas depository securities company is a non-corporate body like a partnership enterprise or a non-corporate venture capital enterprise, the following application materials must be checked:

a. Partnership agreement or non-corporate venture capital enterprise contract signed by investment parties and the articles of association, with the enterprise seal; and

b. List of names of all partners or investment parties and their valid identification papers, as well as their copies.

G. For the valid identification papers of an overseas depository securities company, they must carry the same investor name and number with those on the submission forms; and the copies kept must be the same with the originals (where a copy is not required, the original must be kept).

H. The application materials submitted by the overseas depository securities company shall be in the Chinese language. If both a Chinese version and a foreign-language version are submitted, the Chinese version shall prevail.

2) If a shareholder chooses to submit his exercise application materials on his own, he shall submit the following to the Company:

(1) An individual investor shall submit the following as the exercise application materials:

A. Fill in and sign up Letter of Confirmation of Investors on Manual Application for Exercise (for the format refers to Attachment 1 of this announcement) which was notarized as truthfulness and valid by relevant notary organizations.

B. Valid identification documents and copies

In terms of a foreign investor is natural persons, his/her valid identification documents refer to Hong Kong Identity Card, Identity Card of Macau Resident, Mainland Travel Permit for Taiwan Resident, Certificate of Permanent Residence of Chinese Resident who is also an overseas countries (regions) residence holder and China's passport, identity card of residence in overseas countries (regions) or passport, etc.. (same below)

C. In terms of an investor who entrusts others for application, he/she shall provide letter of commission was notarized as truthfulness and valid by relevant notary organizations and its copies, valid certificate of identity documents and copies of the agent.

(2) An institutional investor shall submit the following as the exercise application materials:

A. Fill in and sign up Letter of Confirmation of Investors on Manual Application for Exercise (for the format refers to Attachment 1 of this announcement) which was notarized as truthfulness and valid by relevant notary organizations.

B. Valid identification documents and copies

In terms of a foreign investor is an institution, the valid identification documents refer to business registration documents, or documents proving the establishment of the said institution that with the equal legal effect etc..

If there is a necessary, investors shall provide Tax Registration Certificate, tax certificate etc. as supplemental documents. (if there isn't a registration number on the main page of certificate documents, investors shall provide Tax Registration Certificate or other documents that including tax registration number as a registration ID.)

C. Copies of the legal representative certificate and the valid identification papers of the legal representative, with the official seal of the institution where the legal\ representative belongs

An institutional investor must submit papers to prove the identity of the principal of the

institutional investor, which include but are not limited to the legal representative certificate, the articles of association or resolutions of the board of directors that state the qualifications of the principal, the registration certificate that states the powers and duties of the principal, etc. (hereinafter referred to as the "Legal Representative Certificates" for convenience of statement).

Subject to different applicants, besides the legal representative of a corporate body, the principal of an institutional investor also includes the proxy appointed by the executive partner of a partnership enterprise or a body, the principal of a non-corporate of a venture capital enterprise, directors and main shareholders of an overseas body, etc. (hereinafter referred to as the "Legal Representative").

D. Legal Representative authorization letter which is signed and notarized as factual and valid by the relevant notary organ, with the signature/seal of the Legal Representative and the official seal of the institution

Where the principal of an institutional investor appoints a proxy, an authorization letter which is signed and notarized as factual and valid by the relevant notary organ, with the signature/seal of the Legal Representative and the official seal of the institution, must be submitted.

E. Valid identification papers of the operator and their copies

F. Where the institutional investor is a non-corporate body like a partnership enterprise or a non-corporate venture capital enterprise, the following application materials must be checked:

a. Partnership agreement or non-corporate venture capital enterprise contract signed by investment parties and the articles of association, with the enterprise seal; and

b. List of names of all partners or investment parties and their valid identification papers, as well as their copies.

(3) Notes for submitting the aforesaid exercise application materials

A. For the valid identification papers of an investor, they must carry the same investor name and number with those on the submission forms; the copies kept must be the same with the originals (where a copy is not required, the original must be kept); and if they are the same with the certificates and information previously submitted to the
Shenzhen branch of China Securities Depository and Clearing Co., Ltd., the investor does not need to submit authentication or notarization materials according to the requirements in B and D below.

B. Except for the Chinese passport and the Mainland travel permit for Taiwan residents signed and issued by the relevant department of China, as well as the passport of an investor from a foreign country/region with the visa and entry procedures handled properly, other aforesaid application materials of an overseas investor must be authenticated or notarized according to the following requirements:

a. The application materials submitted by a Hong Kong investor must be notarized by a Hong Kong public notary entrusted by the Judicial Department of China, with the special seal of China Legal Service (H.K.) Ltd. for Hong Kong notarial document transmission. Where a Hong Kong natural-person investor submits his/her Mainland
Travel Permit for Hong Kong Residents at the same time, his/her ID card needs no authentication.

b. The application materials submitted by a Macau investor must be notarized by the notary offices of the Macau government or a public notary entrusted by the Judicial
Department of China, with the check seal of China Legal Service (Macau) Ltd..
Where a Macau natural-person investor submits his/her Mainland Travel Permit for Macau Residents at the same time, his/her ID card needs no authentication.

c. The application materials submitted by a Taiwan corporate investor must be notarized by

the notary offices of Taiwan. And Straits Exchange Foundation must send, according to the "Cross-Strait Agreement on Notarial Certificate Use and Check" of 1993, the notarial certificate copy to the Mainland notary association. And the Mainland notary association must issue an examination certificate to state that the original notary certificate and the copy sent by Straits Exchange Foundation are the same.

d. The application materials submitted by an investor from a foreign country/region must be authenticated by the embassy/consulate of China in the country/region, or the investor can go through the identification procedures as stipulated in the relevant treaties signed by China and the country/region. Where the country/region has no diplomatic relation with China, the application materials submitted by the investor must be first authenticated by the ministry of foreign affairs of the country/region or its authorized organ and the embassy/consulate of a third country in the country/region that has diplomatic relation with China, and then authenticated by the embassy/consulate of China in the third country.

C. The application materials submitted by the overseas investor shall be in the Chinese language. If both a Chinese version and a foreign-language version are submitted, the Chinese version shall prevail.

D. Where the authorizer of an overseas natural person or institution is entitled to sign an authorization letter and the "Confirmation Letter for Investor Applying for Exercising Cash Options Manually" in China, a Chinese notary office must notarize the signing to prove that the authorization letter and the "Confirmation Letter for Investor Applying for Exercising Cash Options Manually" are signed in China and are factual and valid. Overseas notarization and authentication is not needed.

If an overseas natural person or his commission agent, or the Legal Representative of an overseas institution or the legally authorized commission agent signs the Confirmation Letter of Investor Applying for Exercise Manually under the on-site witness of

the company's lawyers, domestic or overseas notarization and authentication is not needed.

2. Matters to be confirmed before the exercise

(1) The qualified B-share holders can choose to exercise their cash options totally or partially. During the period for application of cash options, the tradable share holders, who have applied for exercising their cash options and it is confirmed as effective by Shenzhen Branch of China Securities Depository and Clearing Corporation Limited, shall not withdraw the applied cash options totally or partially.

(2) Before the application for exercise, the B-share holders shall confirm that the entrusted amount of exercise orders doesn't exceed the amount of cash options in their securities account under the operating units and there is sufficient CIMC B-share in their securities account. If the holders of frozen or pledged shares plan to exercise their cash options, they shall release such freezing or pledge before the application. If the amount of cash options applied to exercise by B-share holders exceeds the amount of unfrozen or unpledged shares actually held in their securities account under operating units, such exercise entrust fails; otherwise the former will be the effective application amount.

(3) If a B-share holder pledged his/her holding shares or his/her holding shares was judicial frozen or deducted by force during manual exercise application to allocation period of exercise shares, thereof leads to the insufficiency of exercise shares on actual allocation, the exercise submission fails to exercise.

3. The Company's stock transaction treatment during the exercise period

During the period for application of cash options, the Company's B-share will stop to trade.

4. Amount of cash options, deduction of shares and gaining of exercise funds after the exercise

After B-share holders succeed in exercising, it will deduct relevant amount of cash options and CIMC B-share in the securities accounts of the B-share holders; within three working

days since Shenzhen Branch of China Securities Depository and Clearing Corporation Limited transfers the shares involving the qualified application\ of cash options to the name of the third party, and the third party will pay in cash to the designated account of relevant investors that didn't trust their B-shares of the Company in domestic securities company at the price of HKD 9.83 for each cash option and meanwhile deduct relevant taxes and fares arising from the shares transfer.

The exchange rate of Hong Kong dollar shall be determined by middle price of exchange rate disclosed by People's Bank of China on the exercise and clearance date of cash option.

5. After the expiration of the application, the unexercised cash options in the securities account of B-share holders will be written off.

6. Expenses

The B-share holders shall undertake all the expenses arising from their manual application for exercising cash options or withdrawal of application. The third party shall withhold the transfer fees of exercised shares from B-share holders in accordance with the amount of exercised shares applying for transfer. The exchange rate of Hong Kong dollar shall be determined by middle price of exchange rate disclosed by People's Bank of China on the exercise and clearance date of cash option.

V. Commitments made by the third party of cash options

The third party that provides the cash options is Broad Ride Limited (Chinese name: 博驰有限公司, hereinafter refer to as "Broad Ride Limited", "the company"). Broad Ride Limited is a limited liability company (registration No. 1699017) incorporated by Hony Capital Fund V, L.P. in British Virgin Islands. It is a wholly-funded subsidiary of Hony Capital Fund V, L.P.. As an exempted limited partnership and a fund denominated in the US dollars, Hony Capital Fund V, L.P. was established and managed by Hony Capital

Fund V GP, L.P. (also an exempted limited partnership incorporated in the Cayman Islands).

Broad Ride Limited makes the commitments as follows:

"Our company's financial status is good enough to perform the duties of the third party stipulated by the above plan; as the third party in the above plan, our company will perform the duties of the third party stipulated by the above plan, and make all necessary efforts to assist CIMC Group and Guotai Junan as well as other parties (if any) to promote the implementation of the above plan;"

Of which, "the above plan" refers to the Announcement on the Plan Regarding Listing Location Change and Listing & Trading of Domestically Listed Foreign Shares on Main Market of the Stock Exchange of Hong Kong Limited through Introduction published on 15 Aug. 2012, "Guotai Junan" refers to Guotai Junan Securities (Hongkong) Co., Ltd.

VI. Schedule on the implementation of cash options

29 Nov. 2012 The final trading date of B-share cash option

4 Dec. 2012 Registration date of B-share cash option

Trading days from 5 Dec. 2012 to 11 Dec. 2012

9:30—11:30 a.m., 1:00—3:00 p.m.

(the application will be expired on 3:00 p.m. of 11 Dec. 2012. In terms of manual application, the arrival and sign in of transport or post can be until the expiration date of application period)

Application period of cash option"

Source: extract from company website

Appendix 9 – First profit Warning Guangzhou shipbuilding (taken from the company website)

Hong Kong Exchanges and Clearing Limited and The Stock Exchange of Hong Kong Limited take no responsibility for the contents of this announcement, make no representation as to its accuracy or completeness and expressly disclaim any liability whatsoever for any loss howsoever arising from or in reliance upon the whole or any part of the contents of this announcement.

GSI 广船国际 广州广船国际股份有限公司 GUANGZHOU SHIPYARD INTERNATIONAL COMPANY LIMITED

(a joint stock company with limited liability incorporated in the People's Republic of China)

Stock Code: 00317

PROFIT WARNING

This announcement is made pursuant to Rule 13.09(1) of the Listing Rules.

The unaudited net profit of the Group for the first quarter as at March 31, 2012 prepared in accordance with the PRC Accounting Standards and Regulations is expected to decrease by about 50% compared with the net profit for the same period in 2011.

Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company.

*This announcement is made pursuant to Rule 13.09(1) of the Rules Governing the Listing of Securities on The Stock Exchange of Hong Kong Limited ("**Listing Rules**")*

Based on the preliminary estimation by Guangzhou Shipyard International Company Limited

(the "Company"), the unaudited net profit of the Company and its subsidiaries (collectively the "Group") for the first quarter as at March 31, 2012 prepared in accordance with the PRC Accounting Standards for Business Enterprises and Relevant Regulations ("PRC Accounting Standards and Regulations") is expected to decrease by about 50% compared with the published net profit for the same period in 2011.

The Group's net profit attributable to the shareholders of the Company and earnings per share for the first quarter as at March 31, 2011 prepared in accordance with the PRC Accounting Standards and Regulations amounted to RMB174,893,277.95 and RMB0.27 per share (base on the total number of issued shares of the Company as at the date of this announcement) respectively.

During the first quarter of 2012, as affected by the decline of the shipbuilding market, the prices of the ships under construction dropped sharply as compared to the same period last year, which resulted in the decrease in profits of the Company derived from shipbuilding.

This information contained in this announcement is only based on the preliminary calculations by the Company's management in accordance with the management accounts of the Company which have not yet been confirmed or audited by the Company's auditors. Investors are advised to carefully read the first quarterly report as at March 31, 2012 of the Company, which is expected to be published on the websites of The Stock Exchange of Hong Kong Limited (www.hkexnews.hk) and the Company (www.chinagsi.com) on April 26, 2012.

The Company also made a profit warning announcement in accordance with the Listing Rules of Shanghai Stock Exchange at the same time.

Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company.

Source: extract from company website

Appendix 10 – Second profit Warning Guangzhou shipbuilding (taken from the company website)

"Hong Kong Exchanges and Clearing Limited and The Stock Exchange of Hong Kong Limited take no responsibility for the contents of this announcement, make no representation as to its accuracy or completeness and expressly disclaim any liability whatsoever for any loss howsoever arising from or in reliance upon the whole or any part of the contents of this announcement."

GSI 广船国际 广州广船国际股份有限公司 GUANGZHOU SHIPYARD INTERNATIONAL COMPANY LIMITED

"(a joint stock company with limited liability incorporated in the People's Republic of China)"

"Stock Code: 00317"

"PROFIT WARNING"

"This announcement is made pursuant to Rule 13.09(1) of the Rules Governing the Listing of Securities on The Stock Exchange of Hong Kong Limited.

The unaudited net profit of the Group for the first half of the year 2012 prepared in accordance with the PRC Accounting Standards and Regulations is expected to decrease by more than 50% compared with the net profit for the same period in 2011.

Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company."

"This announcement is made pursuant to Rule 13.09(1) of the Rules Governing the Listing of Securities on The Stock Exchange of Hong Kong Limited.

Based on the preliminary estimation by Guangzhou Shipyard International Company Limited (the "Company"), the unaudited net profit of the Company and its subsidiaries (collectively the "Group") for the first half of the year 2012 prepared in accordance with the PRC Accounting Standards for Business Enterprises and Relevant Regulations ("PRC Accounting Standards and Regulations") is expected to decrease by more than 50% compared with the published net profit for the same period in 2011.

The Group's net profit attributable to the shareholders of the Company and earnings per share for the first half of the year 2011 prepared in accordance with the PRC Accounting Standards and Regulations amounted to RMB263,385,863.96 and RMB0.41 per share (base on the total number of issued shares of the Company as at the date of this announcement) respectively.

During the first half of the year 2012, as affected by the decline of the shipbuilding market, the prices of the ships under construction dropped sharply as compared with the same period last year, which resulted in the decrease in profits of the Company derived from shipbuilding. Moreover, in order to maintain normal production and operation, the Company secured a batch of 6 vessels in the first half of the year 2012, and could make an impairment loss for these vessels.

The information contained in this announcement is only based on the preliminary calculations by the Company's management in accordance with the management accounts of the Company which have not yet been confirmed or audited by the Company's auditors. Investors are advised to carefully read the interim report 2012 of the Company, which is expected to be published on the websites of The Stock Exchange of Hong Kong Limited

(www.hkexnews.hk) and the Company (www.chinagsi.com) on August 23, 2012.

The Company also made a profit warning announcement in accordance with the Listing Rules of Shanghai Stock Exchange at the same time.

Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company."

Source: extract from company website

Appendix 11 – Third profit Warning Guangzhou shipbuilding (taken from the company website)

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GSI 广船国际 广州广船国际股份有限公司 GUANGZHOU SHIPYARD INTERNATIONAL COMPANY LIMITED

"(a joint stock company with limited liability incorporated in the People's Republic of China)"

"Stock Code: 00317"

"PROFIT WARNING"

"This announcement is made pursuant to Rule 13.09(1) of the Listing Rules.

The unaudited net profit of the Group for the first three quarters of 2012 prepared in accordance with the PRC Accounting Standards and Regulations is expected to decrease by more than 50% compared with the published net profit for the same period in 2011. It is also expected that the Group will record a loss for the third quarter of the year based on the PRC Accounting Standards and Regulations.

Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company."

*"This announcement is made pursuant to Rule 13.09(1) of the Rules Governing the Listing of Securities on The Stock Exchange of Hong Kong Limited ("**Listing Rules**")*

Based on the preliminary estimation by Guangzhou Shipyard International Company Limited (the "Company"), the unaudited net profit of the Company and its subsidiaries (collectively the "Group") for the first three quarters of 2012 prepared in accordance with the PRC Accounting Standards for Business Enterprises and Relevant Regulations ("PRC Accounting Standards and Regulations") is expected to decrease by more than 50% compared with the published net profit for the same period in 2011. It is also expected that the Group will record a loss for the third quarter of the year ending on 30 September 2012 based on the PRC Accounting Standards and Regulations.

The Group's net profit attributable to the shareholders of the Company and earnings per share prepared in accordance with the PRC Accounting Standards and Regulations for the first three quarters of 2011 amounted to RMB408,847,101.99 and RMB0.64 per share and for the third quarter as at September 30, 2011 amounted to RMB145,461,238.03 and RMB0.23 per share respectively.

During the first three quarters of 2012, as affected by the decline of the shipbuilding market, the prices of the ships under construction dropped sharply as compared to the same period last year, which resulted in the decrease in profits of the Company derived from shipbuilding. Moreover, in order to maintain normal production and operation, the Company has secured orders for nine vessels in the first three quarters of year 2012, impairment losses in respect of eights of those vessels could be made.

This information contained in this announcement is only based on the preliminary calculations by the Company's management in accordance with the management accounts of

the Company which have not yet been confirmed or audited by the Company's auditors. Investors are advised to carefully read the third quarterly report of the Company, which is expected to be published on the websites of The Stock Exchange of Hong Kong Limited (www.hkexnews.hk) and the Company (www.chinagsi.com) on October 30, 2012.

The Company also made a profit warning announcement in accordance with the Listing Rules of Shanghai Stock Exchange at the same time.

Shareholders of the Company and potential investors are advised to exercise caution when dealing in the shares of the Company."

Source: extract from company website

Appendix 12 – Full List of H-share companies

Full List of H-share (official list from Hong Kong Stock Exchange)			
Listing Date	Stock Code	Company	Market capitalization (HK$)
2005-10-27	939	China Construction Bank Corporation	1,538,670,847,232
2006-10-27	1398	Industrial and Commercial Bank of China Ltd	483,442,828,144
2006-6-1	3988	Bank of China Ltd	306,057,531,606
2000-4-7	857	PetroChina Co Ltd	224,914,274,000
2005-6-23	3328	Bank of Communications Co Ltd	214,972,836,548
2004-6-24	2318	Ping An Insurance (Group) Co of China Ltd	203,119,636,394
2003-12-18	2628	China Life Insurance Co Ltd	173,379,377,500
2000-10-19	386	China Petroleum & Chemical Corporation	173,098,868,040
2010-7-16	1288	Agricultural Bank of China Ltd	122,955,292,384
2005-6-15	1088	China Shenhua Energy Co Ltd	99,918,325,500
2009-12-23	2601	China Pacific Insurance (Group) Co Ltd	79,373,580,000
2007-4-27	998	China CITIC Bank Corporation Ltd	74,113,171,625
2006-9-22	3968	China Merchants Bank Co Ltd	65,774,239,960
2009-11-26	1988	China Minsheng Banking Corp Ltd	62,402,214,672
2002-11-15	728	China Telecom Corporation Ltd	55,787,188,200
2003-11-6	2328	PICC Property and Casualty Co Ltd	42,349,578,920
2012-12-7	1339	The People's Insurance Co (Group) of China Ltd	41,275,086,820
1997-10-21	914	Anhui Conch Cement Co Ltd	36,843,660,000
2006-3-23	3323	China National Building Material Co Ltd	34,089,395,249
2011-12-15	1336	New China Life Insurance Co Ltd	32,522,673,327
2006-12-15	1800	China Communications Construction Co Ltd	32,497,850,000
2005-12-7	489	Dongfeng Motor Group Co Ltd	32,441,115,520
1993-7-15	168	Tsingtao Brewery Co Ltd	31,803,608,592
2006-12-19	1898	China Coal Energy Co Ltd	31,580,238,470
2003-12-15	2333	Great Wall Motor Co Ltd	31,357,013,000
2004-12-15	753	Air China Ltd	28,653,651,526
1998-1-21	902	Huaneng Power International Inc	28,371,959,851
1997-6-12	358	Jiangxi Copper Co Ltd	25,779,415,560
2002-11-20	2883	China Oilfield Services Ltd	25,263,663,920
2009-12-10	916	China Longyuan Power Group Corporation Ltd	23,614,005,030
1998-4-1	1171	Yanzhou Coal Mining Co Ltd	23,539,968,000
2012-12-19	2039	China Int'l Marine Containers (Group) Co Ltd	23,202,393,856
2011-10-6	6030	CITIC Securities Co Ltd	23,048,089,812
2002-7-31	1211	BYD Co Ltd	21,810,250,000
2009-9-23	1099	Sinopharm Group Co Ltd	20,294,353,275
2012-4-27	6837	Haitong Securities Co Ltd	19,493,225,400
2007-12-7	390	China Railway Group Ltd	17,713,111,900
2008-3-13	1186	China Railway Construction Corporation Ltd	16,880,286,480

2003-12-23	2899	Zijin Mining Group Co Ltd	16,041,787,200
2010-12-23	1157	Zoomlion Heavy Industry Science and Technology Co	14,643,495,793
2010-8-30	2238	Guangzhou Automobile Group Co Ltd	14,297,919,408
2004-3-11	2338	Weichai Power Co Ltd	14,281,344,000
2004-2-27	1066	Shandong Weigao Group Medical Polymer Co Ltd	13,581,710,056
2005-7-14	2777	Guangzhou R&F Properties Co Ltd	13,360,800,544
2001-12-12	2600	Aluminum Corporation of China Ltd	13,212,285,993
2008-8-21	1766	CSR Corporation Ltd	12,852,400,000
2011-5-20	2607	Shanghai Pharmaceuticals Holding Co Ltd	12,790,428,464
1997-7-31	1055	China Southern Airlines Co Ltd	11,962,244,760
2006-12-20	3898	Zhuzhou CSR Times Electric Co Ltd	11,699,180,460
1997-2-5	670	China Eastern Airlines Corporation Ltd	11,601,159,000
2006-12-8	552	China Communications Services Corporation Ltd	11,598,388,164
2000-2-1	694	Beijing Capital International Airport Co Ltd	11,464,120,400
1997-3-21	991	Datang International Power Generation Co Ltd	11,173,833,438
2010-12-16	3618	Chongqing Rural Commercial Bank Co Ltd	10,933,011,778
2005-6-30	1919	China COSCO Holdings Co Ltd	10,735,296,000
1997-6-27	177	Jiangsu Expressway Co Ltd	9,580,480,000
2005-4-28	2727	Shanghai Electric Group Co Ltd	9,364,672,800
1997-5-15	576	Zhejiang Expressway Co Ltd	9,334,392,795
2006-12-8	1818	Zhaojin Mining Industry Co Ltd	8,935,816,120
2006-9-29	3983	China BlueChemical Ltd	8,801,870,000
2004-6-16	2866	China Shipping Container Lines Co Ltd	8,627,300,000
2003-10-30	2357	AviChina Industry & Technology Co Ltd	8,388,904,691
2004-12-9	763	ZTE Corporation	8,335,711,292
2003-11-21	1025	Wumart Stores Inc	8,155,833,600
2009-7-29	2009	BBMG Corporation	7,986,882,031
1993-7-26	338	Sinopec Shanghai Petrochemical Co Ltd	7,922,000,000
2012-7-12	3948	Inner Mongolia Yitai Coal Co Ltd	6,683,143,500
2012-12-21	1829	China Machinery Engineering Corporation	6,439,634,300
2011-6-10	958	Huaneng Renewables Corporation Ltd	5,794,057,732
2000-10-31	1666	Tong Ren Tang Technologies Co Ltd	5,710,728,000
1997-7-24	347	Angang Steel Co Ltd	5,667,876,000
1994-11-11	1138	China Shipping Development Co Ltd	5,598,720,000
1996-5-14	525	Guangshen Railway Co Ltd	5,310,123,000
2007-4-26	3993	China Molybdenum Co Ltd	4,995,504,360
1994-6-6	1072	Dongfang Electric Corporation Ltd	4,957,200,000
1999-6-30	1071	Huadian Power International Corporation Ltd	4,851,184,920
2001-2-7	696	TravelSky Technology Ltd	4,737,414,960
2009-9-24	1618	Metallurgical Corporation of China Ltd	4,737,150,000
1994-12-16	1133	Harbin Electric Co Ltd	4,580,371,380
2010-12-17	1798	China Datang Corporation Renewable Power Co Ltd	4,276,831,581
2006-3-31	2626	Hunan Nonferrous Metals Corporation Ltd	4,228,765,520

1997-10-30	874	Guangzhou Pharmaceutical Co Ltd	4,142,916,000
2012-10-30	2196	Shanghai Fosun Pharmaceutical (Group) Co Ltd	4,032,840,000
1993-11-3	323	Maanshan Iron & Steel Co Ltd	4,020,397,600
2003-6-19	2868	Beijing Capital Land Ltd	3,603,268,680
2011-12-30	1296	Guodian Technology & Environment Group	3,392,304,300
1994-3-29	1033	Sinopec Yizheng Chemical Fibre Co Ltd	3,192,000,000
1997-6-23	38	First Tractor Co Ltd	3,043,064,300
2012-6-28	816	Huadian Fuxin Energy Corporation Ltd	3,016,443,144
2011-12-22	579	Beijing Jingneng Clean Energy Co Ltd	2,701,950,900
2007-12-20	1893	China National Materials Co Ltd	2,700,823,627
2003-2-13	598	Sinotrans Ltd	2,698,983,060
2003-6-27	980	Lianhua Supermarket Holdings Co Ltd	2,660,364,000
1994-8-17	1122	Qingling Motors Co Ltd	2,625,941,954
2010-10-13	956	China Suntien Green Energy Corporation Ltd	2,547,461,730
1997-10-7	107	Sichuan Expressway Co Ltd	2,390,504,400
1997-3-12	548	Shenzhen Expressway Co Ltd	2,369,575,000
2012-12-5	564	Zhengzhou Coal Mining Machinery Group Co Ltd	2,252,348,692
1996-11-13	995	Anhui Expressway Co Ltd	2,188,964,400
2010-10-8	2208	Xinjiang Goldwind Science & Technology Co Ltd	2,160,202,176
2006-4-28	2880	Dalian Port (PDA) Co Ltd	1,987,062,000
2006-12-15	2006	Shanghai Jin Jiang Int'l Hotels (Group) Co Ltd	1,934,185,000
2007-5-30	811	Xinhua Winshare Publishing and Media Co Ltd	1,922,426,385
2003-6-30	2355	Baoye Group Co Ltd	1,820,253,980
1996-7-23	921	Hisense Kelon Electrical Holdings Co Ltd	1,769,420,761
2003-9-24	2698	Weiqiao Textile Co Ltd	1,671,020,760
2003-1-29	895	Dongjiang Environmental Co Ltd	1,654,470,000
2004-1-9	1265	Tianjin Jinran Public Utilities Co Ltd	1,605,192,600
2002-11-18	357	Hainan Meilan International Airport Co Ltd	1,586,121,870
1997-5-14	588	Beijing North Star Co Ltd	1,484,742,000
2012-7-6	2068	China Aluminum International Engineering Corp Ltd	1,478,061,200
2008-6-13	2722	Chongqing Machinery & Electric Co Ltd	1,386,236,212
2007-10-12	3833	Xinjiang Xinxin Mining Industry Co Ltd	1,320,660,000
1993-8-6	317	Guangzhou Shipyard International Co Ltd	1,319,782,230
1996-2-2	350	Jingwei Textile Machinery Co Ltd	1,287,296,000
2008-6-18	1812	Shandong Chenming Paper Holdings Ltd	1,181,635,400
1994-5-17	1065	Tianjin Capital Environmental Protection Group Co Ltd	1,037,000,000
2005-12-19	3378	Xiamen International Port Co Ltd	1,026,168,000
2007-2-7	568	Shandong Molong Petroleum Machinery Co Ltd	960,474,000
2006-1-12	3330	Lingbao Gold Co Ltd	888,849,260
2004-6-9	1708	Nanjing Sample Technology Co Ltd	872,100,000
1997-9-29	161	AVIC International Holdings Ltd	810,761,357
2006-4-27	2345	Shanghai Prime Machinery Co Ltd	805,292,600
1999-8-5	74	Great Wall Technology Co Ltd	748,888,800

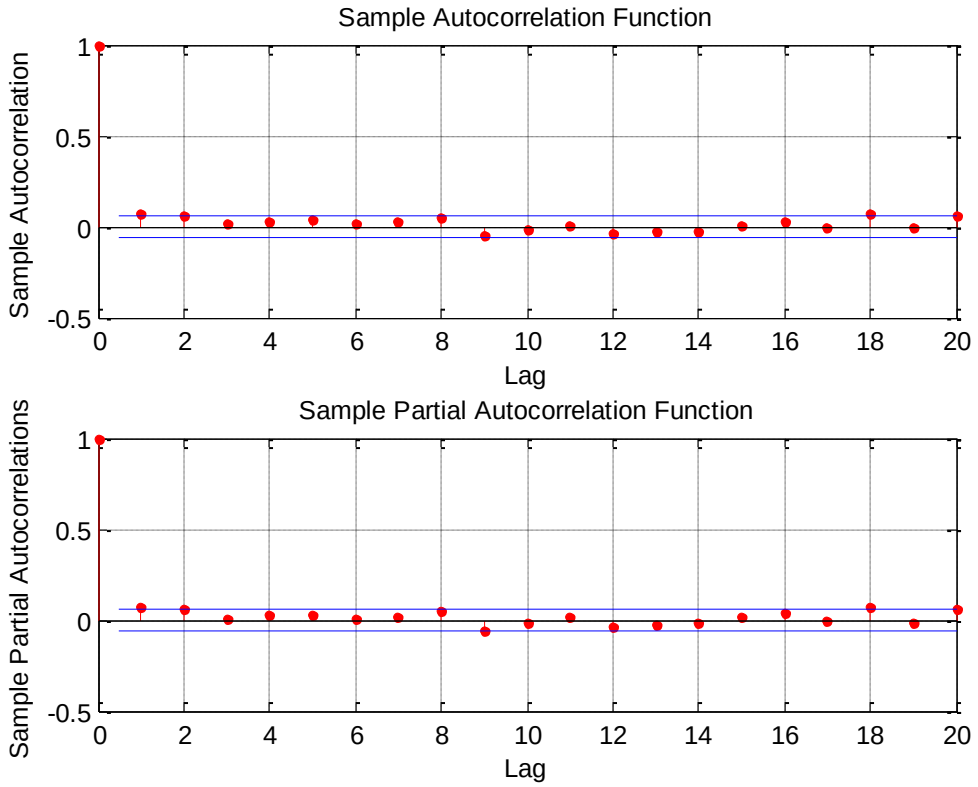
1997-10-17	1053	Chongqing Iron & Steel Co Ltd	737,234,264
2008-2-26	814	Beijing Jingkelong Co Ltd	717,710,400
2007-12-24	839	Anhui Tianda Oil Pipe Co Ltd	671,795,100
2003-4-22	2218	Yantai North Andre Juice Co Ltd	567,258,160
1996-5-2	553	Nanjing Panda Electronics Co Ltd	539,660,000
1994-7-8	1108	Luoyang Glass Co Ltd	425,000,000
2006-4-7	3355	Advanced Semiconductor Manufacturing Corporation	418,593,385
1993-12-7	300	Shenji Group Kunming Machine Tool Co Ltd	357,872,822
1996-12-31	719	Shandong Xinhua Pharmaceutical Co Ltd	345,000,000
2004-12-22	1000	Beijing Media Corporation Ltd	307,445,600
2003-10-10	2308	EVOC Intelligent Technology Co Ltd	286,767,360
1995-7-6	42	Northeast Electric Development Co Ltd	276,006,500
2001-12-21	1075	Capinfo Co Ltd	263,329,320
2006-5-16	1057	Zhejiang Shibao Co Ltd	253,204,880
2004-12-20	438	IRICO Group Electronics Co Ltd	252,352,560
2005-10-26	3399	Guangdong Nan Yue Logistics Co Ltd	249,780,000
2002-10-7	2488	Launch Tech Co Ltd	243,504,000
1993-8-6	187	Beiren Printing Machinery Holdings Ltd	235,000,000
1999-12-16	747	Shenyang Public Utility Holdings Co Ltd	227,016,000
2005-7-13	1103	Shanghai Tonva Petrochemcial Co Ltd	189,318,850
2008-1-24	840	Xinjiang Tianye Water Saving Irrigation System Co Ltd	184,184,000
1994-12-13	1202	Chengdu PUTIAN Telecommunications Cable Co Ltd	155,200,000
2006-6-21	549	Jilin Qifeng Chemical Fiber Co Ltd	124,740,000
2001-12-10	739	Zhejiang Glass Co Ltd	-
Total number	**148**	**Total**	**5,008,963,207,932**

Source: Directly taken from the Hong Kong Stock Exchange website

Note: Not all H-share companies are dual listed companies

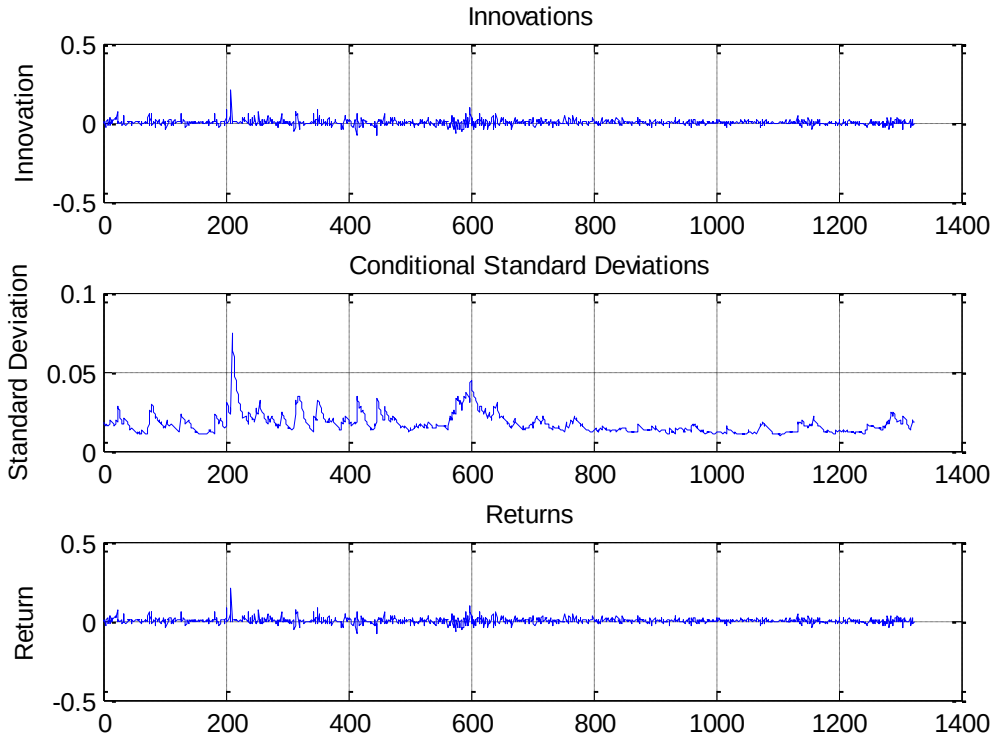
Appendix 13 – GARCH models

Shenjing Group	Shenjing Group H



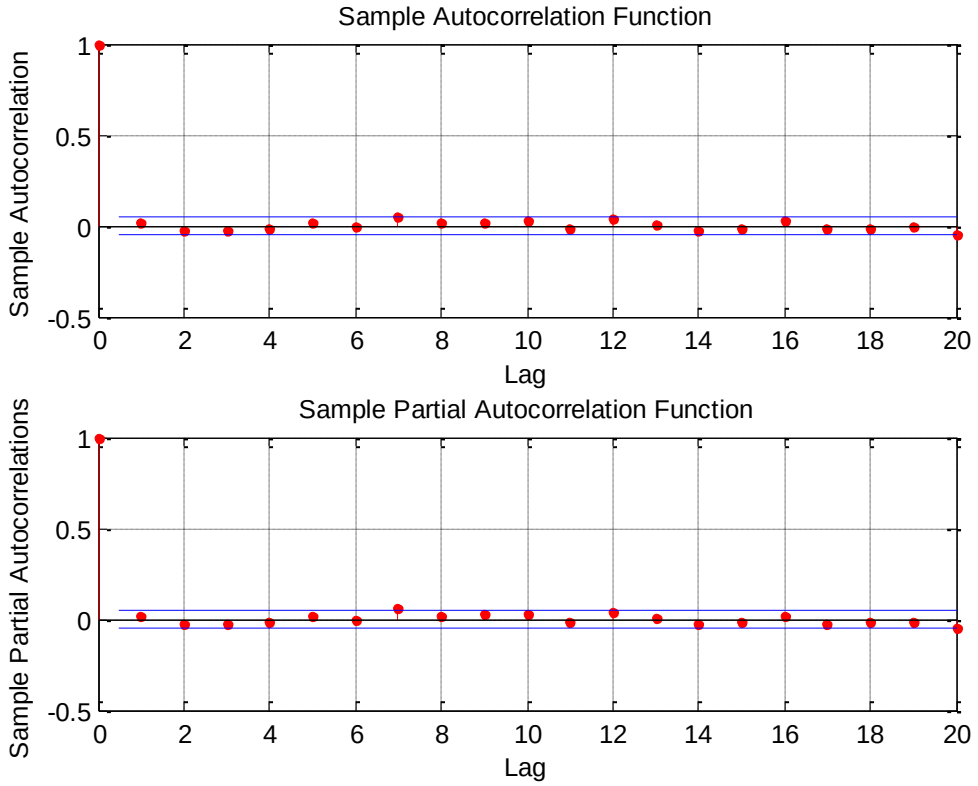
ARCH Test	
H	0
P	0.0820
Fstat	29.3001
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-6.6365e-005	0.00043881	-0.1512
K	1.1165e-005	1.7689e-006	6.3115
GARCH(1)	0.85772	0.012338	69.5183
ARCH(1)	0.11612	0.0089273	13.0070
Log Likelihood value	3573.58		



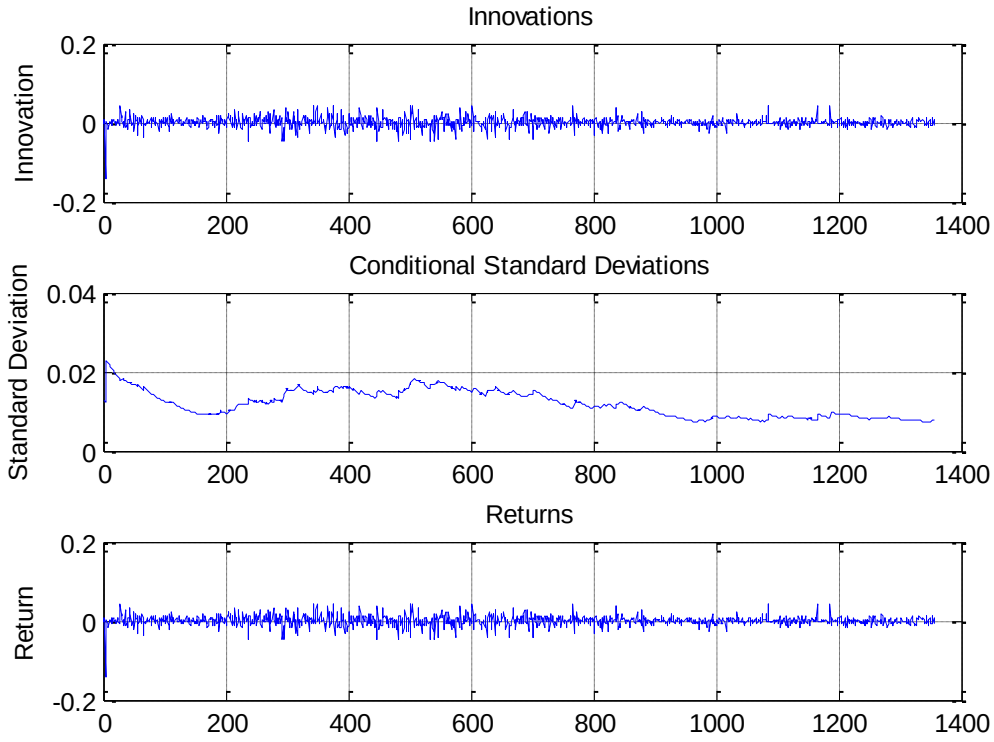
GARCH Comparison	
H	0
P	0.9867

Shenzhen Expressway	Shenzhen Expressway A



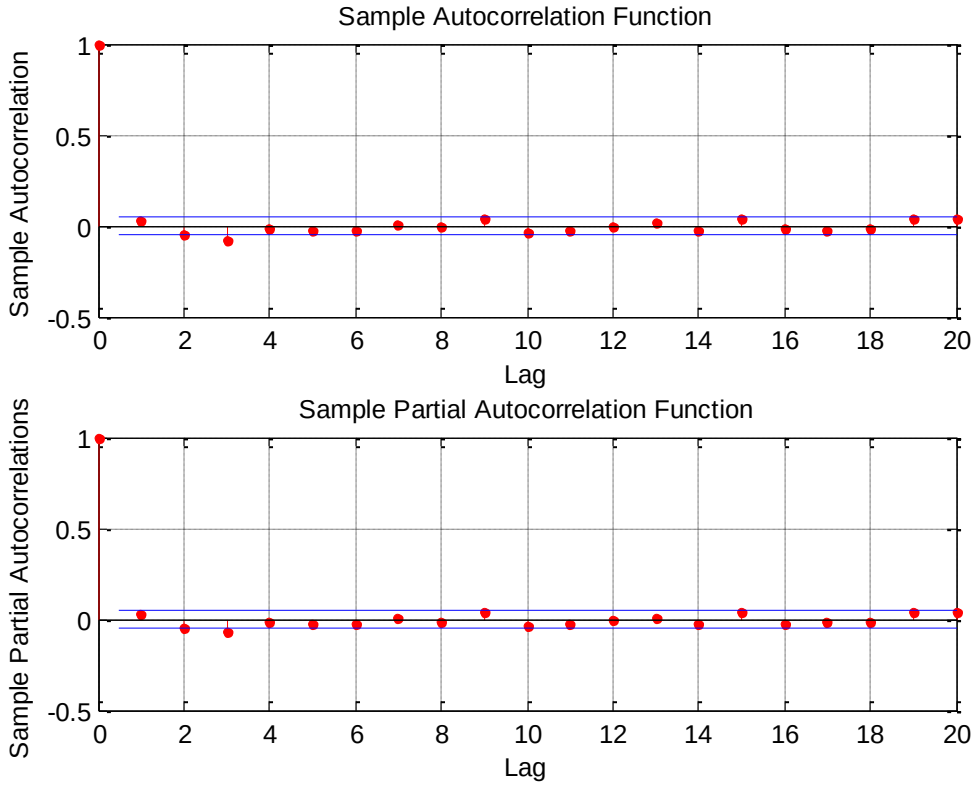
ARCH Test	
H	1
P	1.2081e-009
Fstat	83.0006
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.000144	0.00028645	-0.5027
K	4.4312e-007	1.3905e-007	3.1868
GARCH(1)	0.97679	0.0035781	272.9907
ARCH(1)	0.018572	0.0029771	6.2384
Log Likelihood value	4086.34		



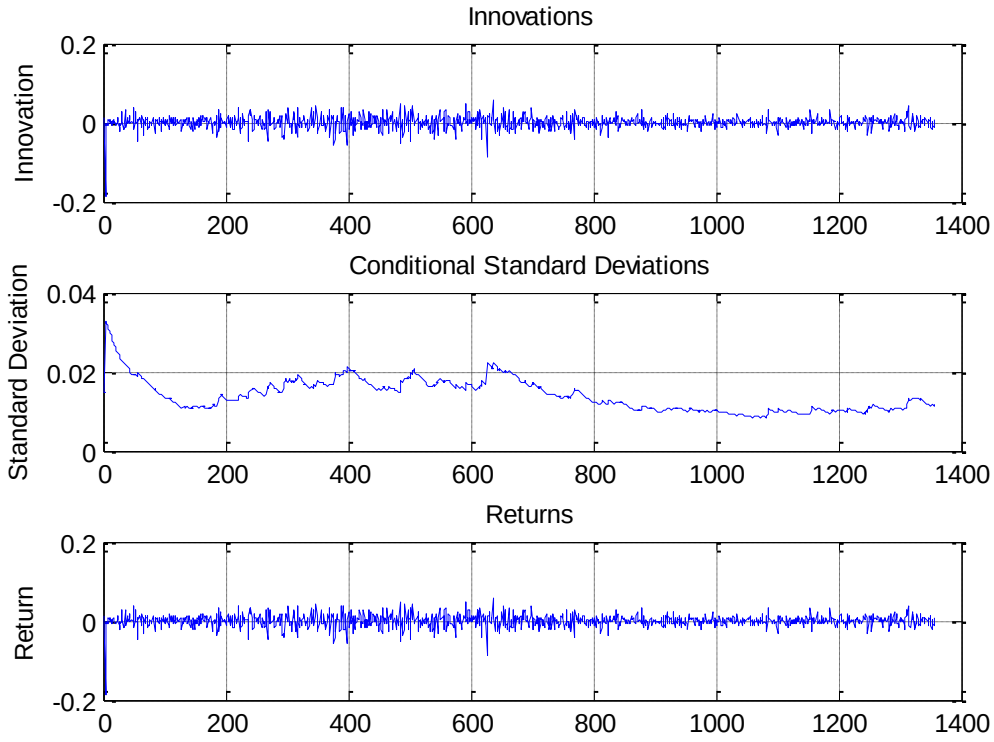
GARCH Comparison	
H	0
P	0.3920

Shenzhen expressway	Shenzhen expressway D



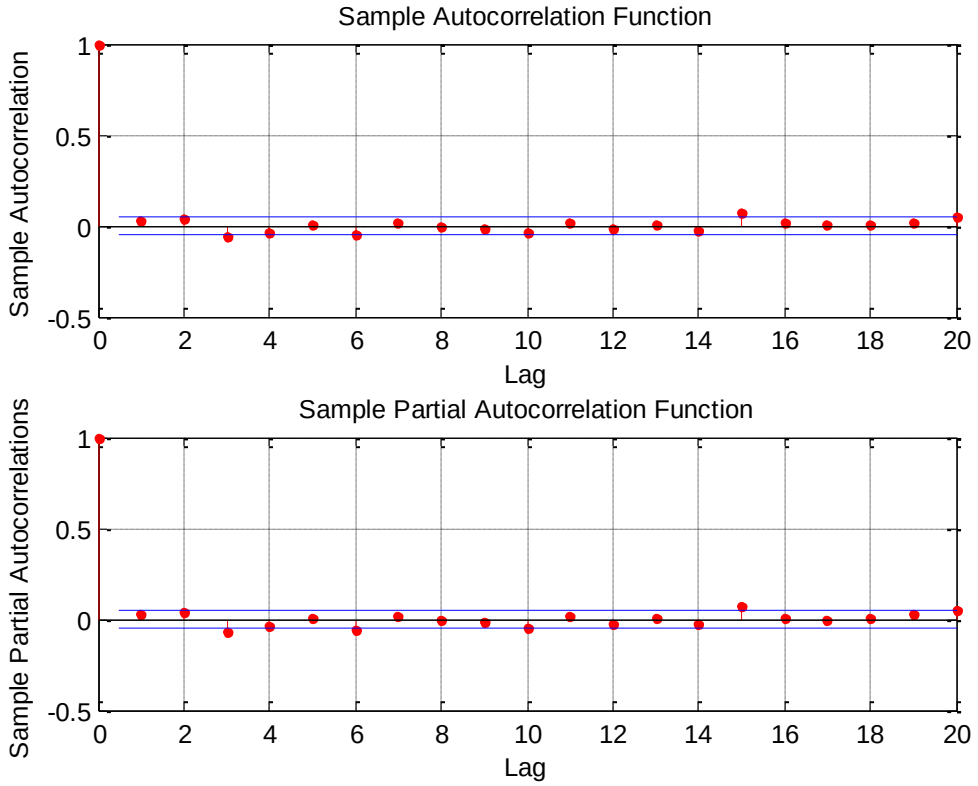
ARCH Test	
H	1
P	103.3442
Fstat	83.0006
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00027931	0.00032459	-0.8605
K	1.0276e-006	3.2267e-007	3.1845
GARCH(1)	0.96861	0.004936	196.2332
ARCH(1)	0.024656	0.0040656	6.0644
Log Likelihood value	3847.3		



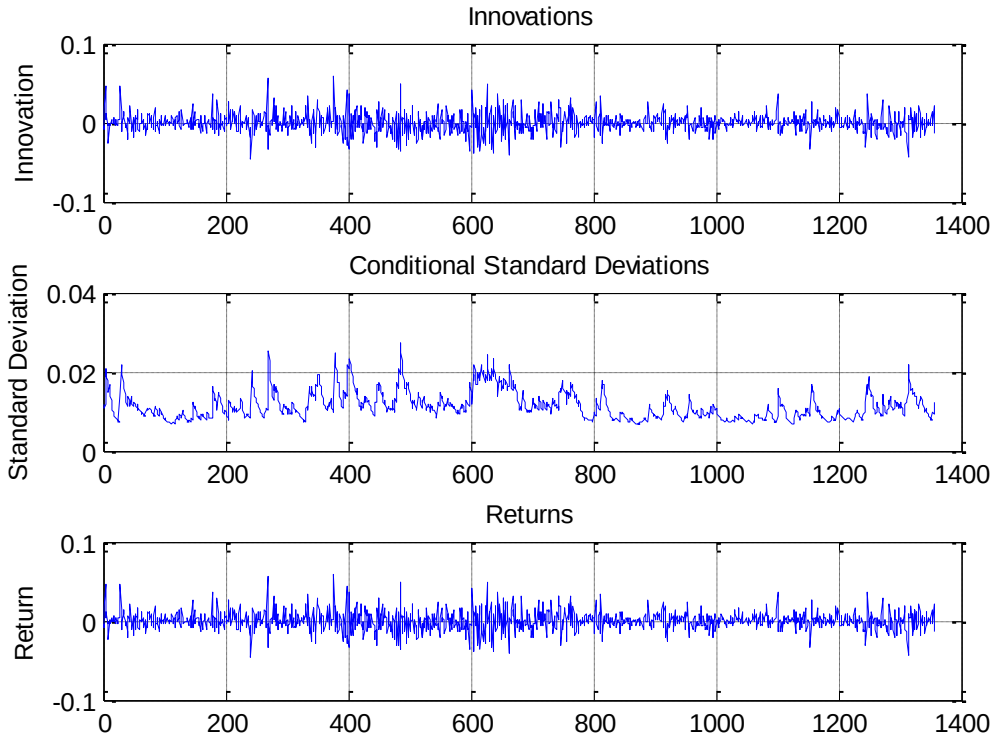
GARCH Comparison	
H	0
P	0.9480

Shenzhen Expressway	Shenzhen Expressway H



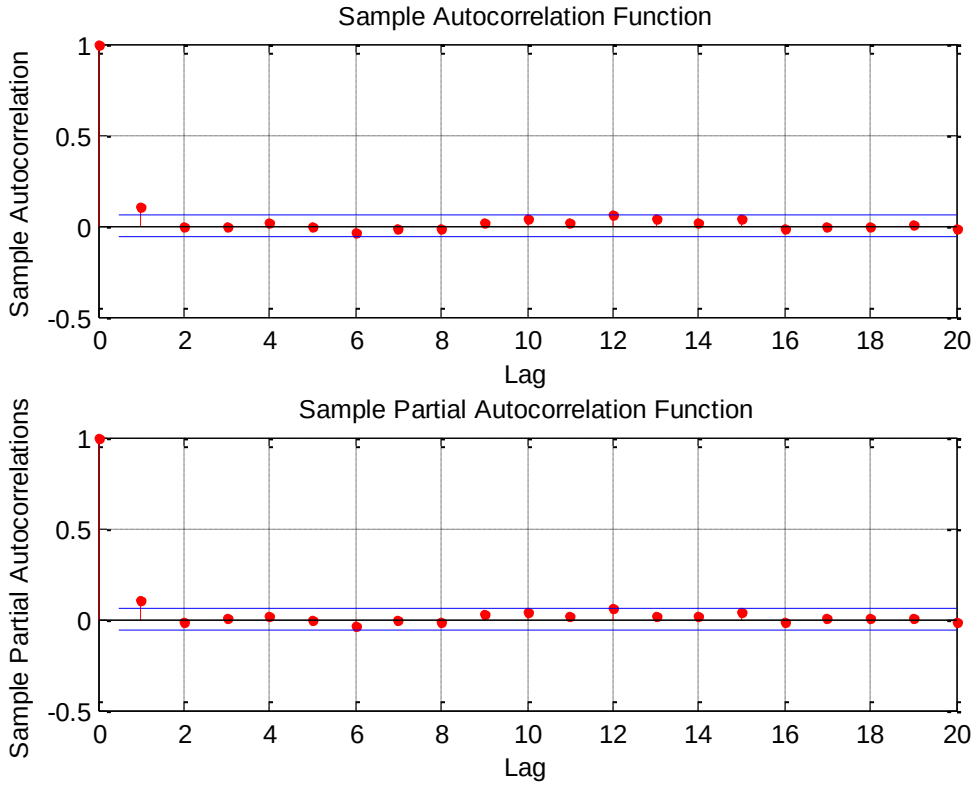
ARCH Test	
H	1
P	1.4200e-010
Fstat	88.3820
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00036141	0.00027843	1.2980
K	8.179e-006	1.3717e-006	5.9627
GARCH(1)	0.80036	0.021345	37.4967
ARCH(1)	0.14681	0.015913	9.2258
Log Likelihood value	4212.87		



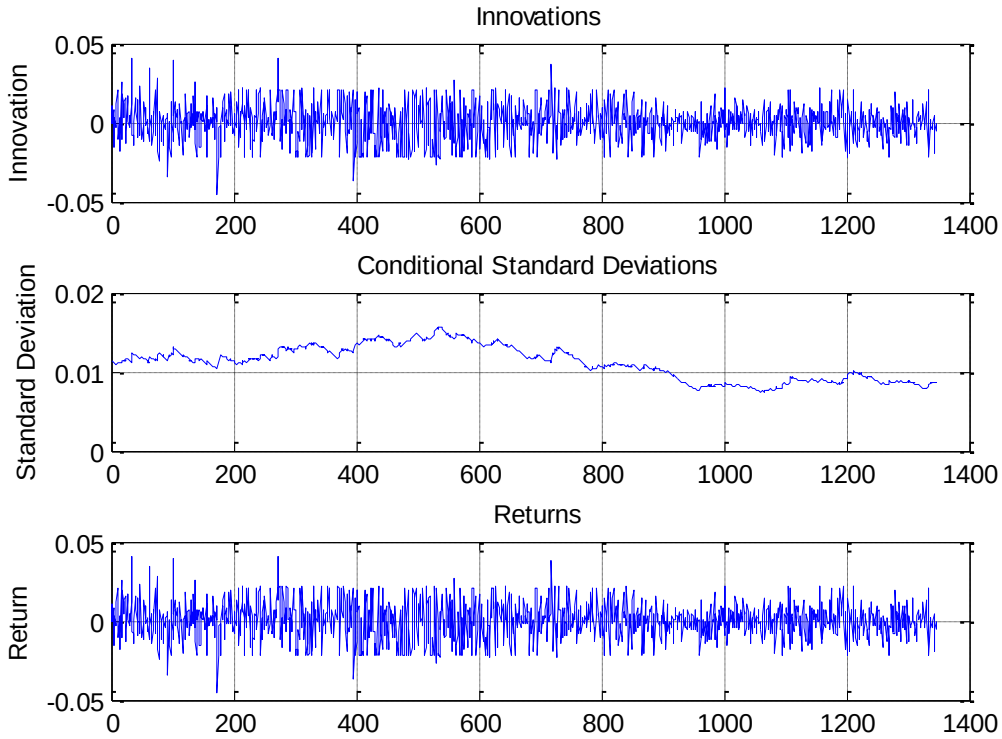
GARCH Comparison	
H	0
P	0.6888

Sinopec Electrical	Sinopec Electrical A



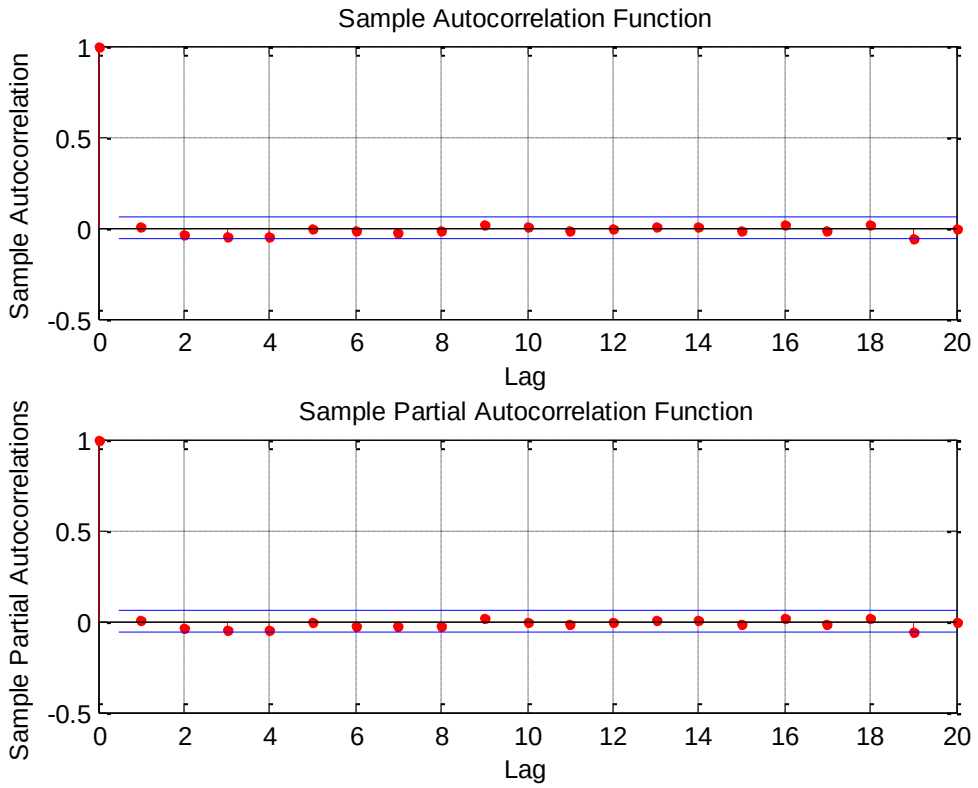
ARCH Test	
H	1
P	1.4986e-009
Fstat	82.4540
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	5.0188e-005	0.00028769	0.1745
K	2e-007	2.2159e-007	0.9026
GARCH(1)	0.98091	0.005409	181.3466
ARCH(1)	0.017094	0.0049249	3.4709
Log Likelihood value	4167.59		



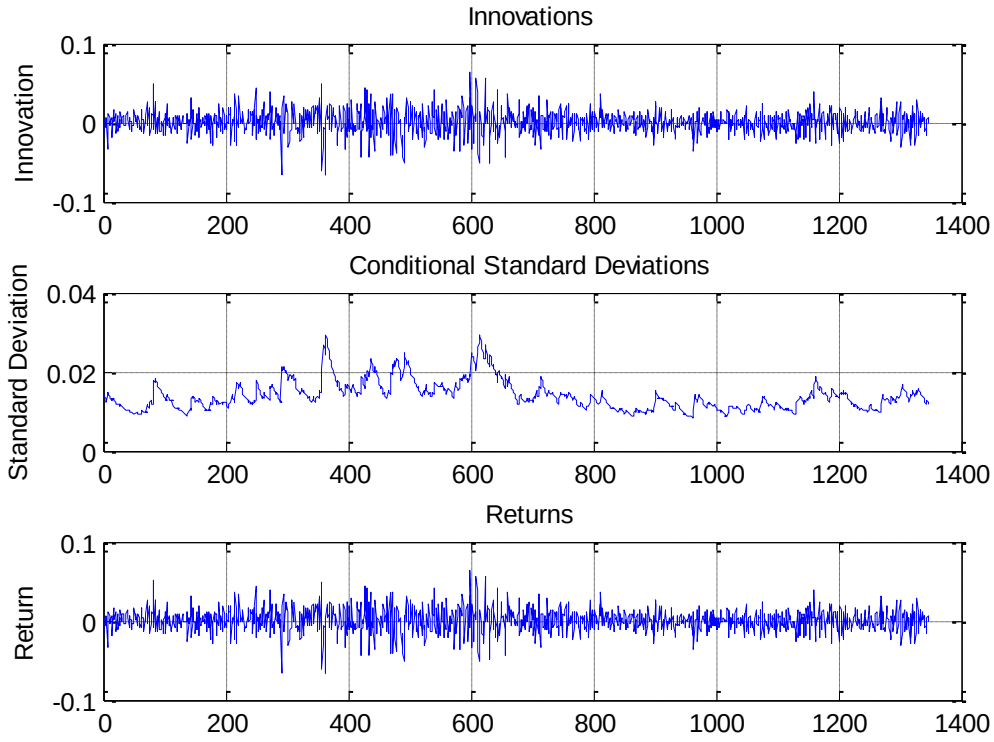
GARCH Comparison	
H	0
P	0.1386

Sinopec Electrical	Sinopec Electrical D



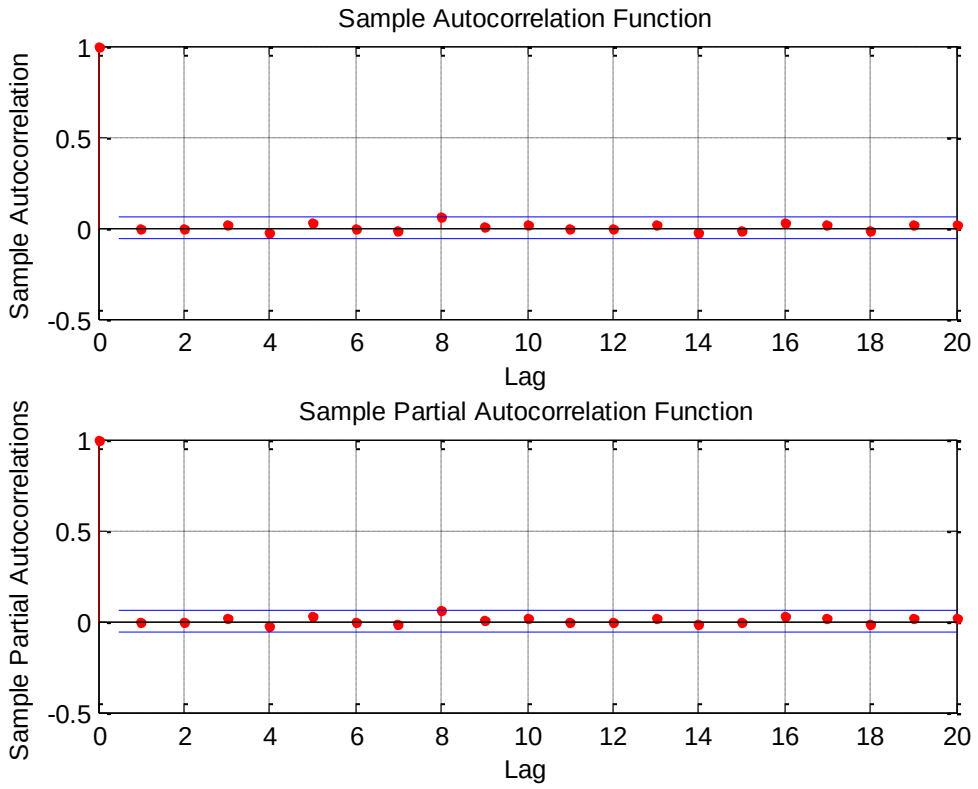
ARCH Test	
H	1
P	0
Fstat	124.1017
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.0001011	0.00034489	0.2931
K	4.4926e-006	1.2245e-006	3.6690
GARCH(1)	0.90532	0.01301	69.5865
ARCH(1)	0.073249	0.01119	6.5461
Log Likelihood value	3891.72		



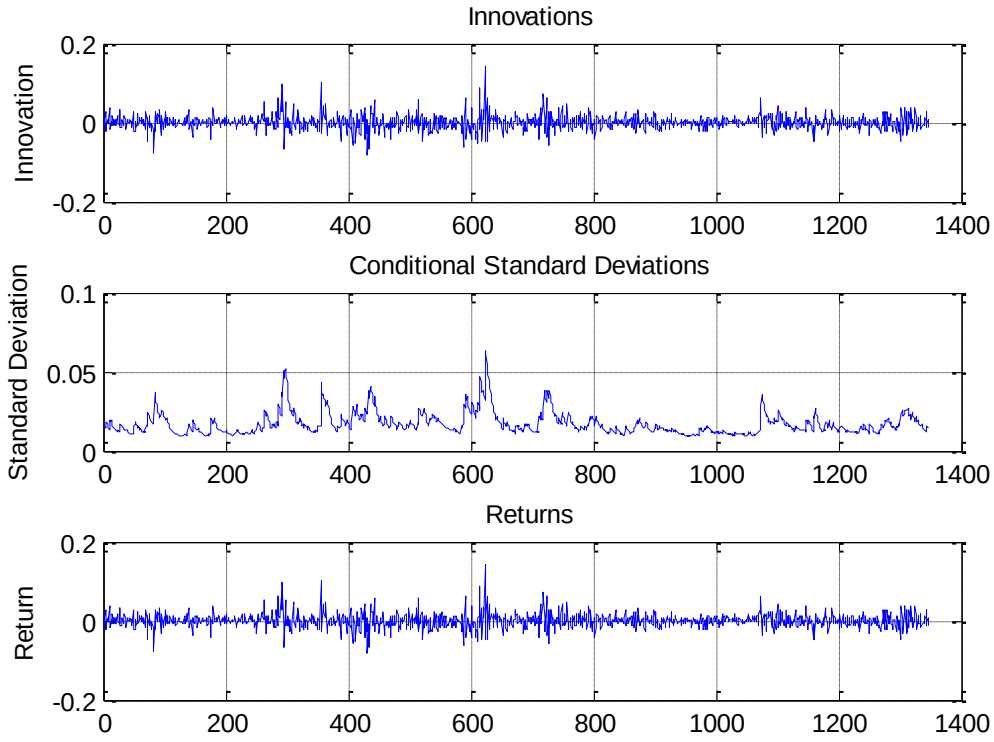
GARCH Comparison	
H	0
P	0.3190

Sinopec Electrical	Sinopec Electrical H



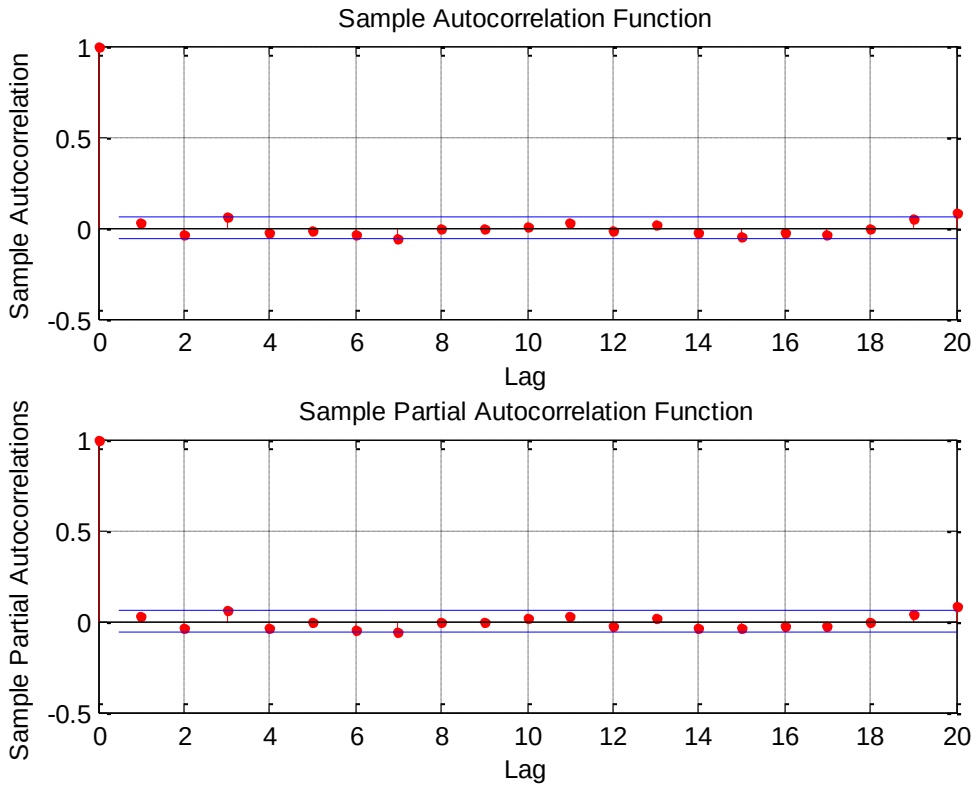
ARCH Test	
H	1
P	0
Fstat	127.9629
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	2.2052e-005	0.00032616	0.0676
K	1.2636e-005	2.1278e-006	5.9389
GARCH(1)	0.81073	0.017626	45.9974
ARCH(1)	0.1611	0.016555	9.7307
Log Likelihood value	3662.69		



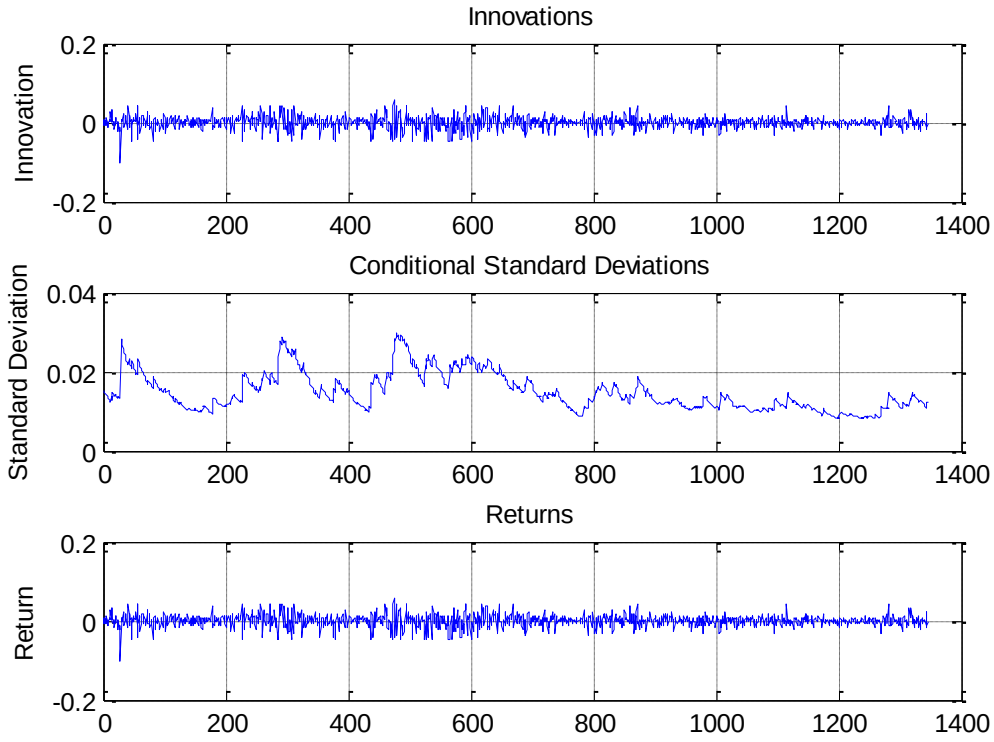
GARCH Comparison	
H	0
P	

Tianjin Capital	Tianjin Capital A

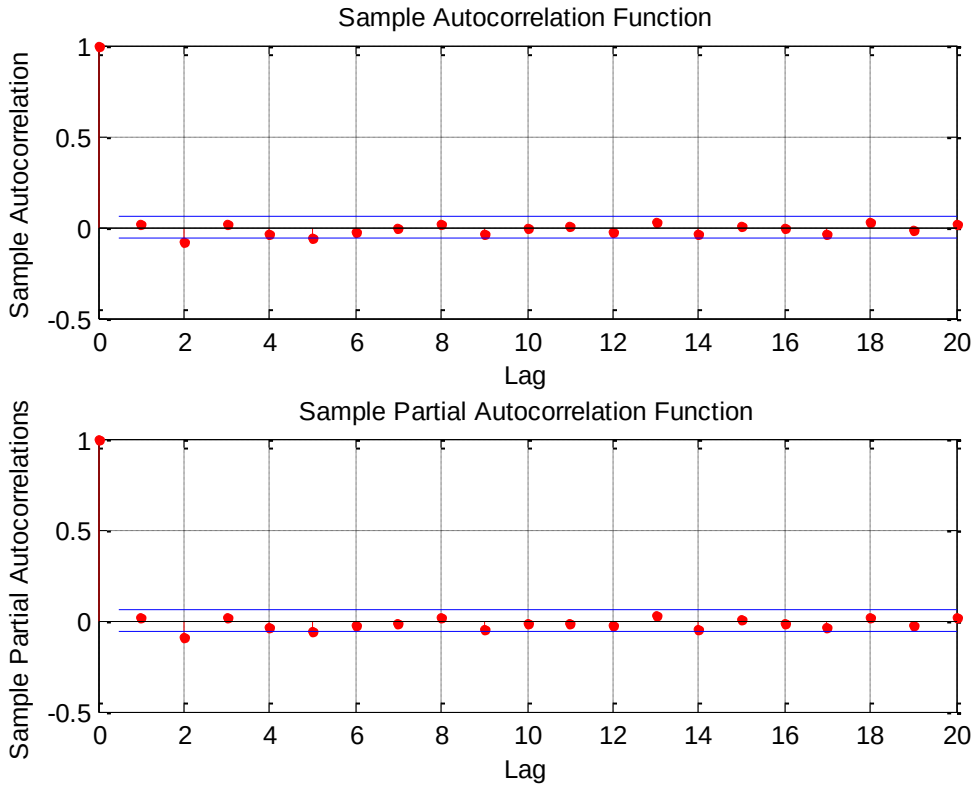


ARCH Test	
H	1
P	0
Fstat	126.2030
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-3.0704e-005	0.00036584	-0.0839
K	2.6826e-006	6.9687e-007	3.8495
GARCH(1)	0.93062	0.0093077	99.9841
ARCH(1)	0.058672	0.0084869	6.9132
Log Likelihood value	3815.72		

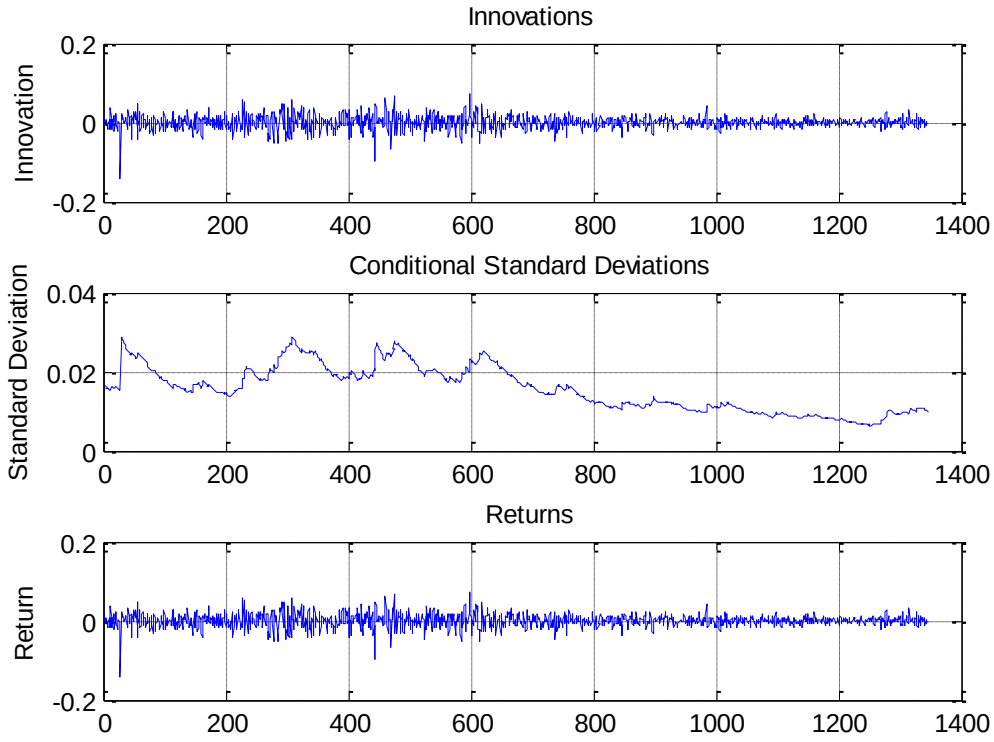

Innovations
Innovation
0.2
0
-0.2
0
200
400
600
800
1000
1200
1400
Conditional Standard Deviations
Standard Deviation
0.04
0.02
0
0
200
400
600
800
1000
1200
1400
Returns
Return
0.2
0
-0.2
0
200
400
600
800
1000
1200
1400

Tianjin Capital D



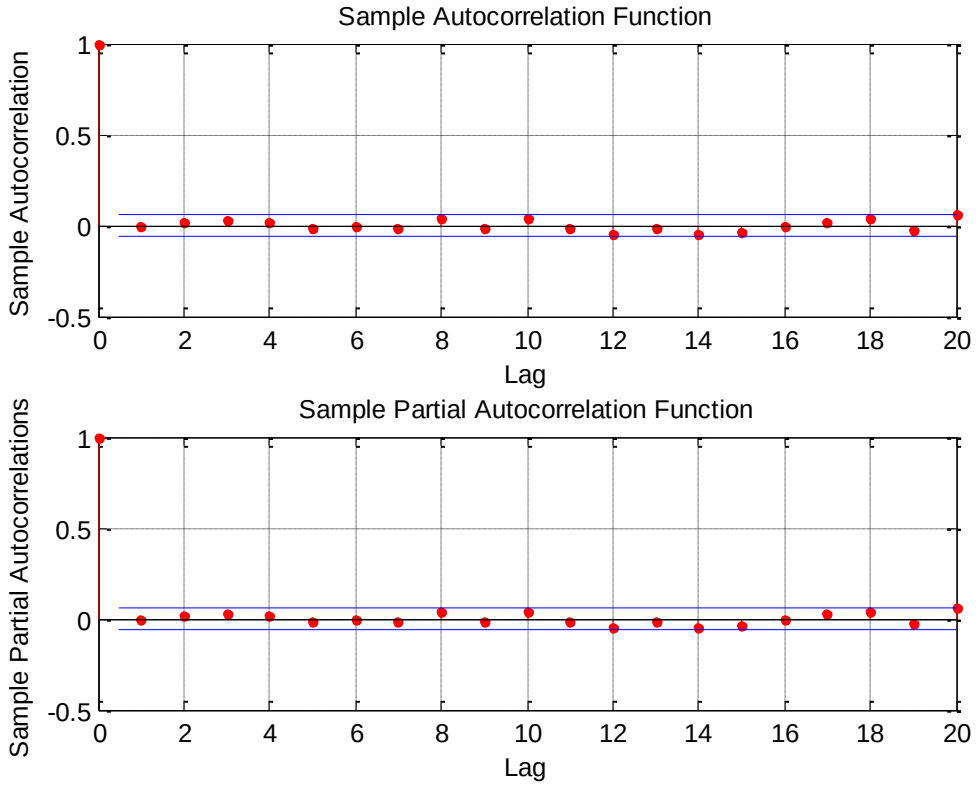
ARCH Test	
H	1
P	1.8123e-005
Fstat	57.3561
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	1.7023e-005	0.00034551	0.0493
K	3.2299e-007	1.8968e-007	1.7028
GARCH(1)	0.96944	0.003877	250.0507
ARCH(1)	0.028947	0.0043596	6.6400
Log Likelihood value	3760		



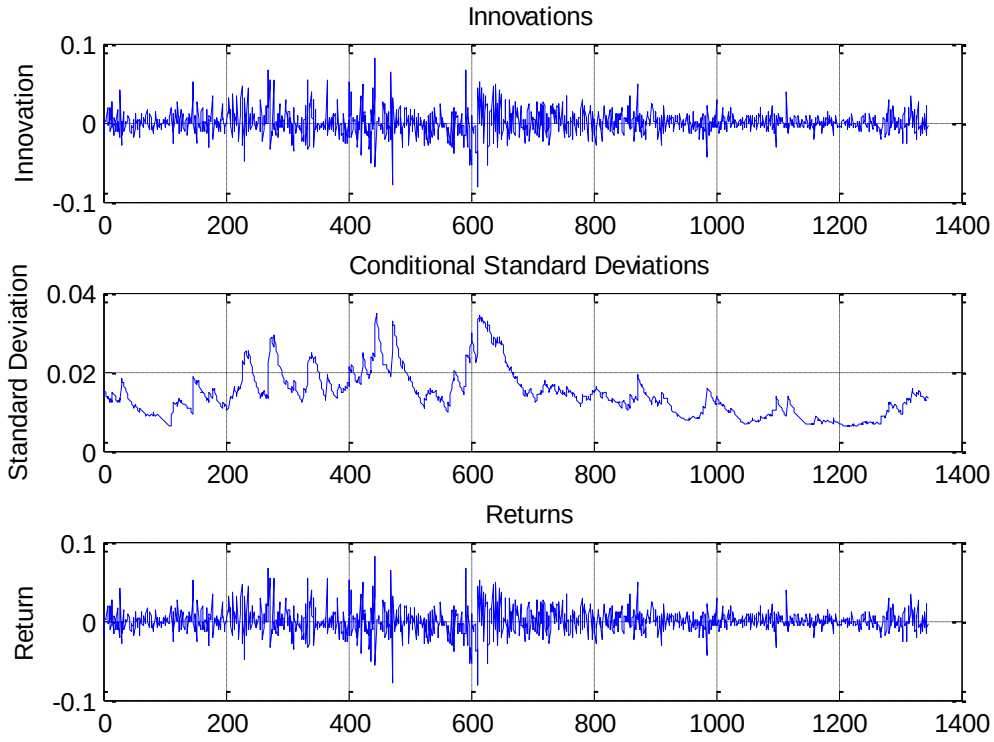
GARCH Comparison	
H	0
P	0.0967

Tianjin Capital	Tianjin Capital H



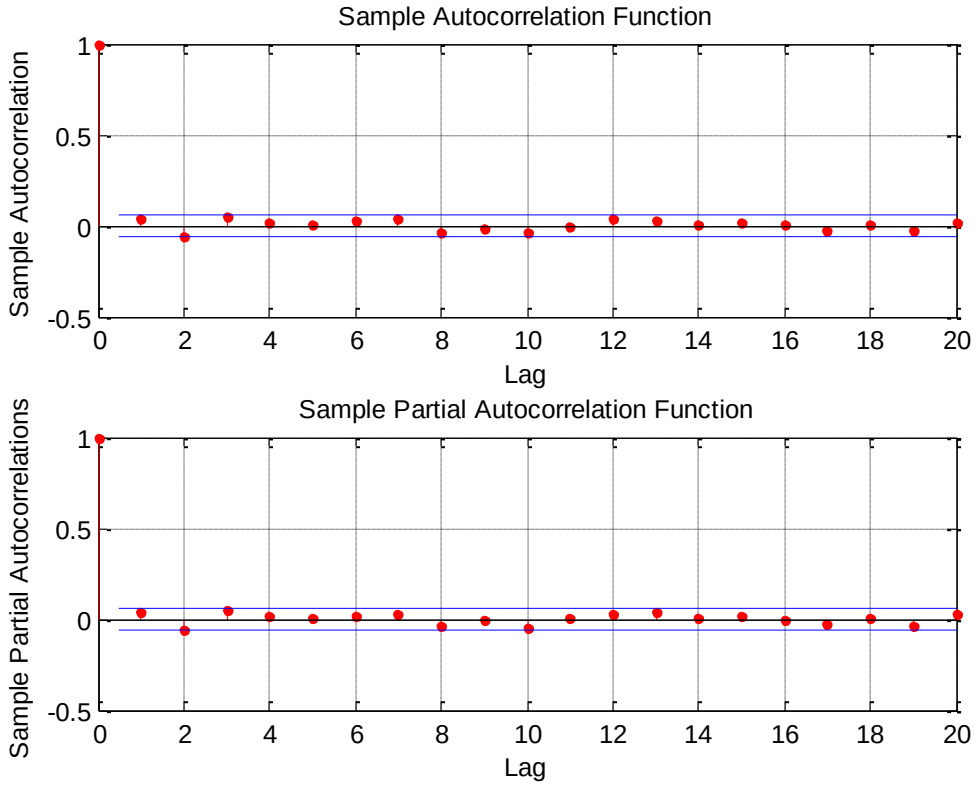
ARCH Test	
H	1
P	0
Fstat	172.8270
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-9.5802e-005	0.00032533	-0.2945
K	1.3209e-006	4.229e-007	3.1234
GARCH(1)	0.91982	0.0068079	135.1102
ARCH(1)	0.078413	0.0079234	9.8963
Log Likelihood value	3917.41		



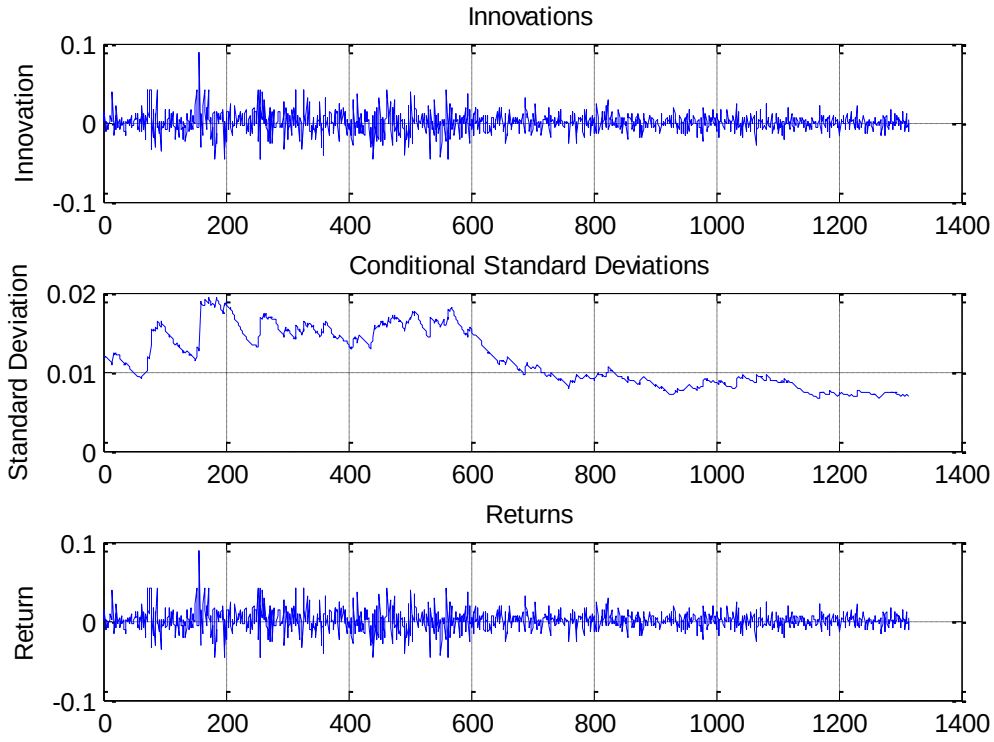
GARCH Comparison	
H	0
P	0.1550

Tsingtao	Tsingtao A



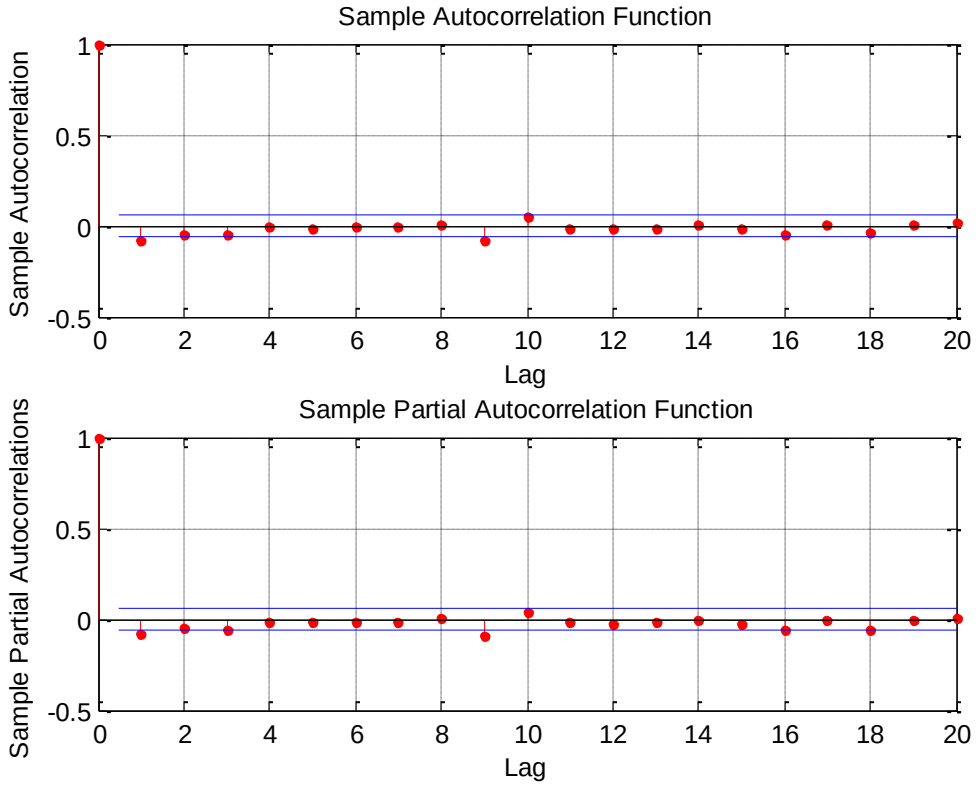
ARCH Test	
H	1
P	7.5054e-010
Fstat	84.2043
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00036704	0.00027892	1.3159
K	2e-007	1.5415e-007	1.2975
GARCH(1)	0.97448	0.0042449	229.5638
ARCH(1)	0.023832	0.0040107	5.9422
Log Likelihood value	4058.33		



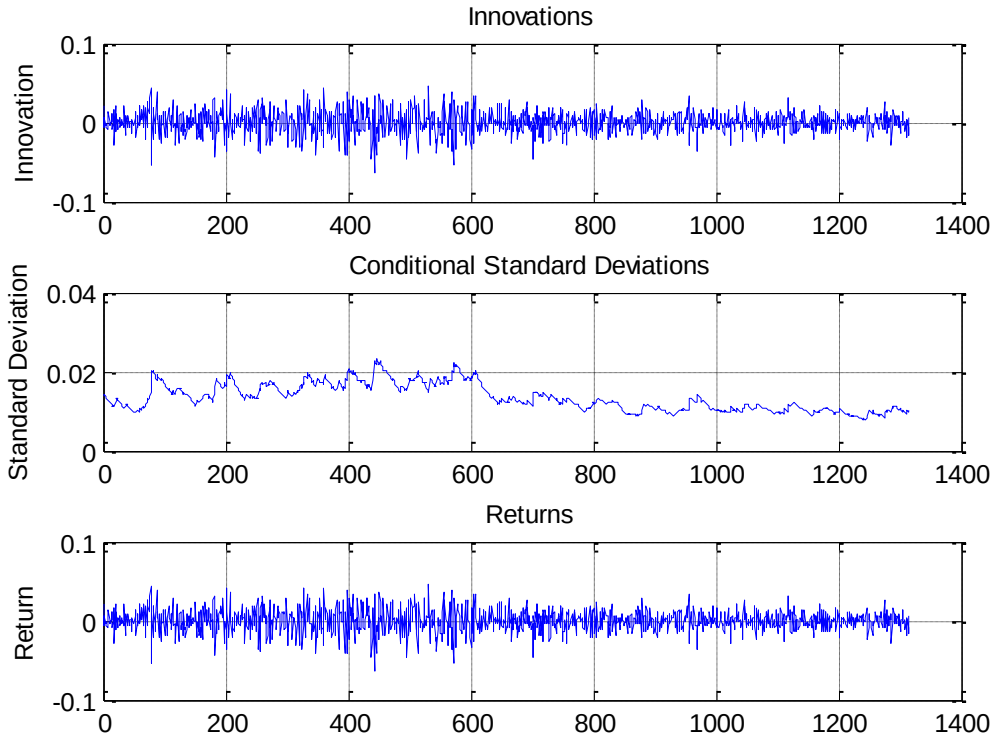
GARCH Comparison	
H	0
P	0.3763

Tsingtao D	Tsingtao D



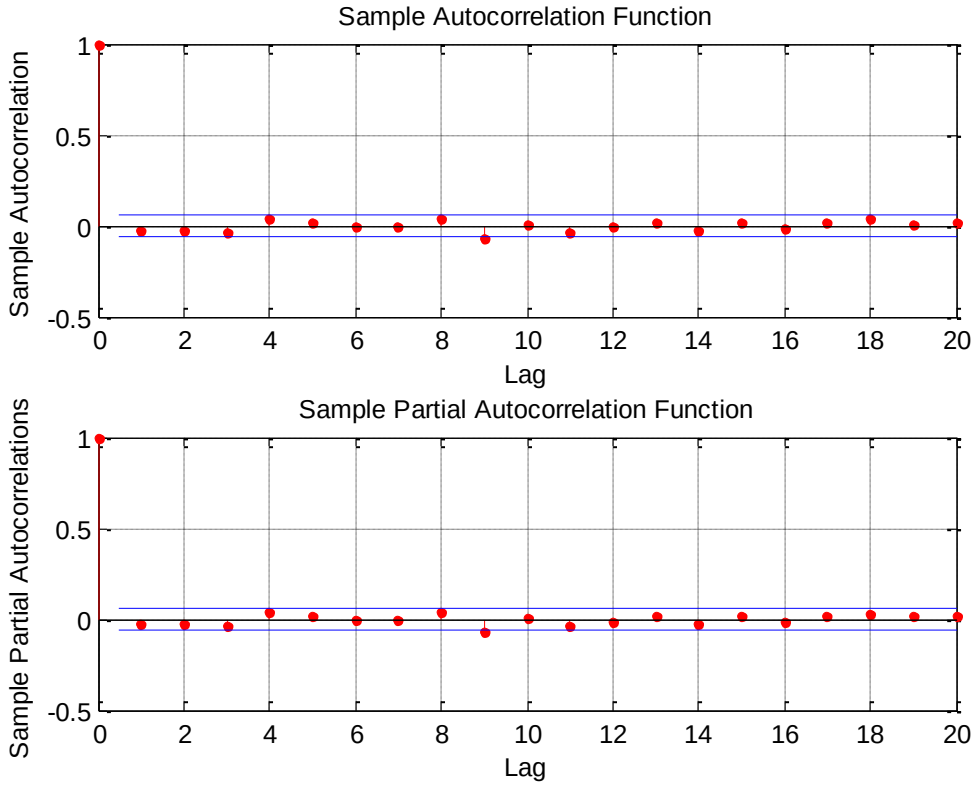
ARCH Test	
H	1
P	6.6946e-014
Fstat	107.0728
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00013617	0.00033254	-0.4095
K	1.4561e-006	6.4905e-007	2.2434
GARCH(1)	0.94595	0.0097669	96.8528
ARCH(1)	0.046503	0.008556	5.4351
Log Likelihood value	3845.38		



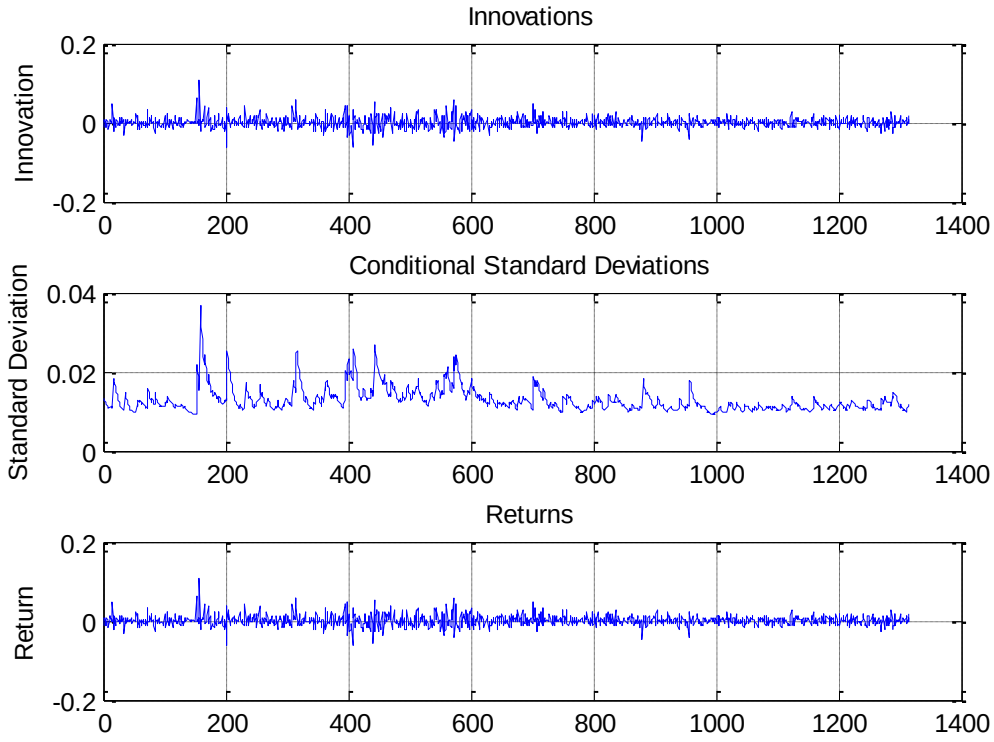
GARCH Comparison	
H	0
P	0.1422

Tsingtao	Tsingtao H



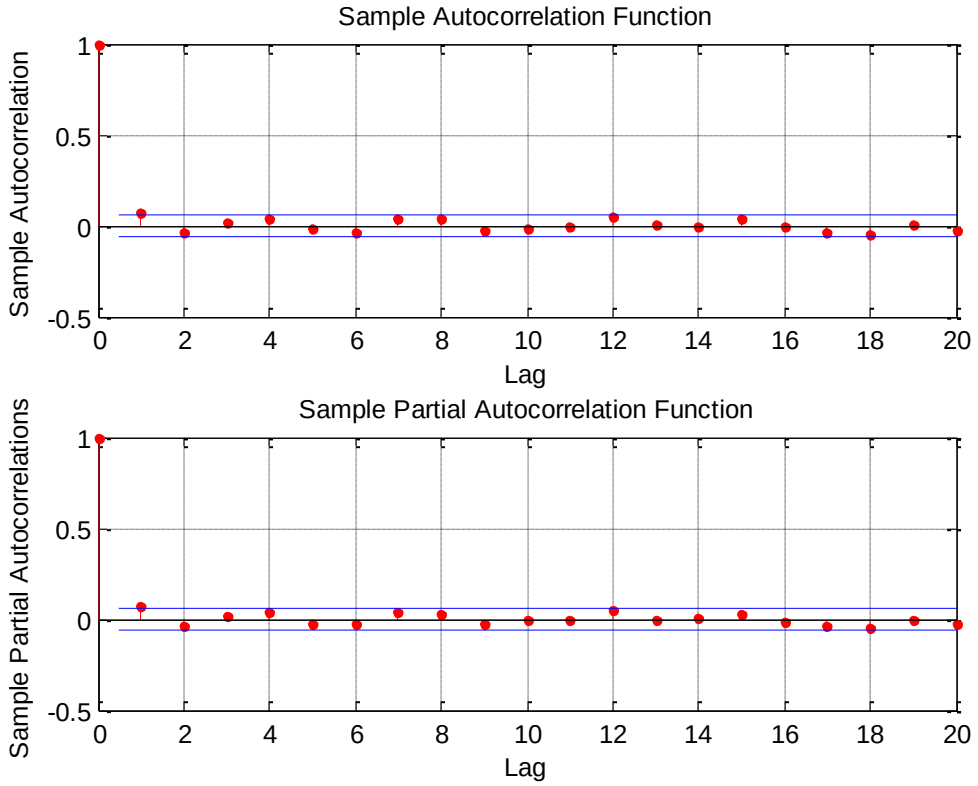
ARCH Test	
H	1
P	9.5855e-009
Fstat	77.7072
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00060369	0.00036183	1.6684
K	1.4911e-005	3.0836e-006	4.8357
GARCH(1)	0.81424	0.034353	23.7021
ARCH(1)	0.10138	0.019811	5.1173
Log Likelihood value	3891.19		



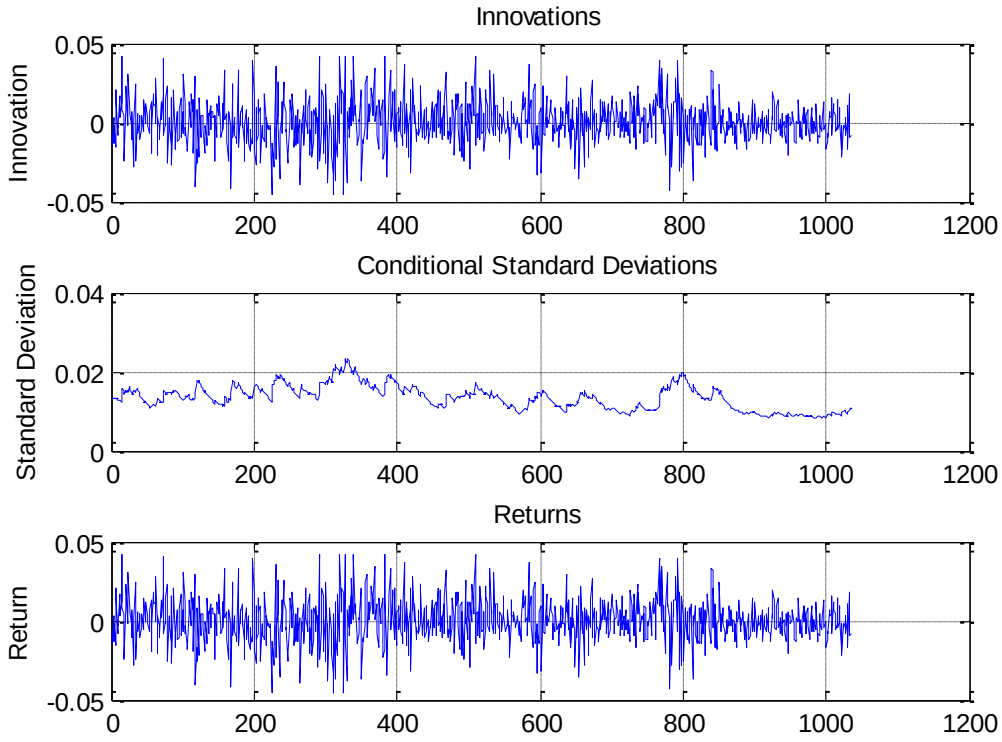
GARCH Comparison	
H	0
P	1

Weichai Power	Weichai Power A



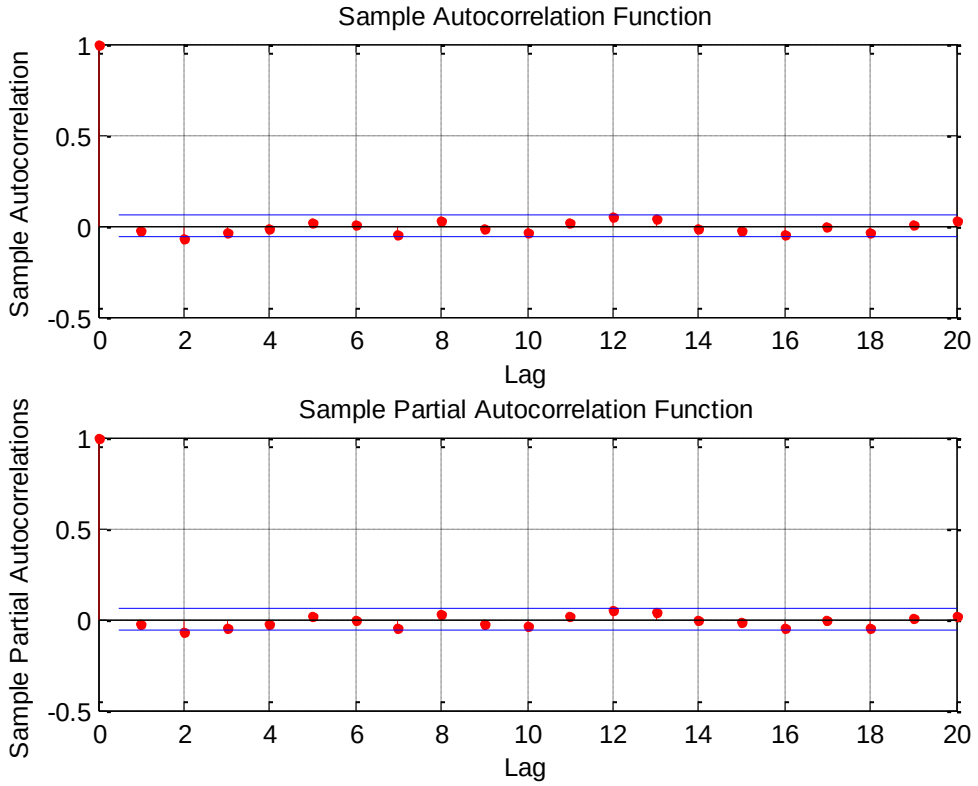
ARCH Test	
H	1
P	2.1379e-008
Fstat	75.6307
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	6.6271e-005	0.00038918	0.1703
K	2.0159e-006	1.0584e-006	1.9046
GARCH(1)	0.93464	0.012811	72.9583
ARCH(1)	0.055164	0.011291	4.8856
Log Likelihood value	3021.92		



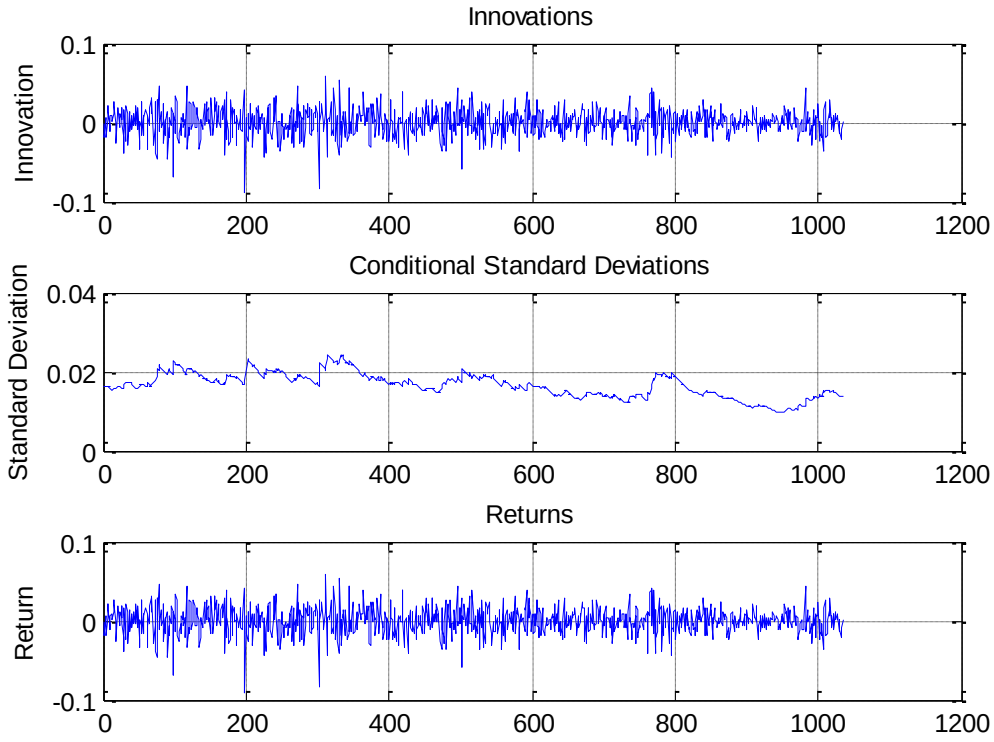
GARCH Comparison	
H	0
P	0.1583

Weichai Power	Weichai Power D



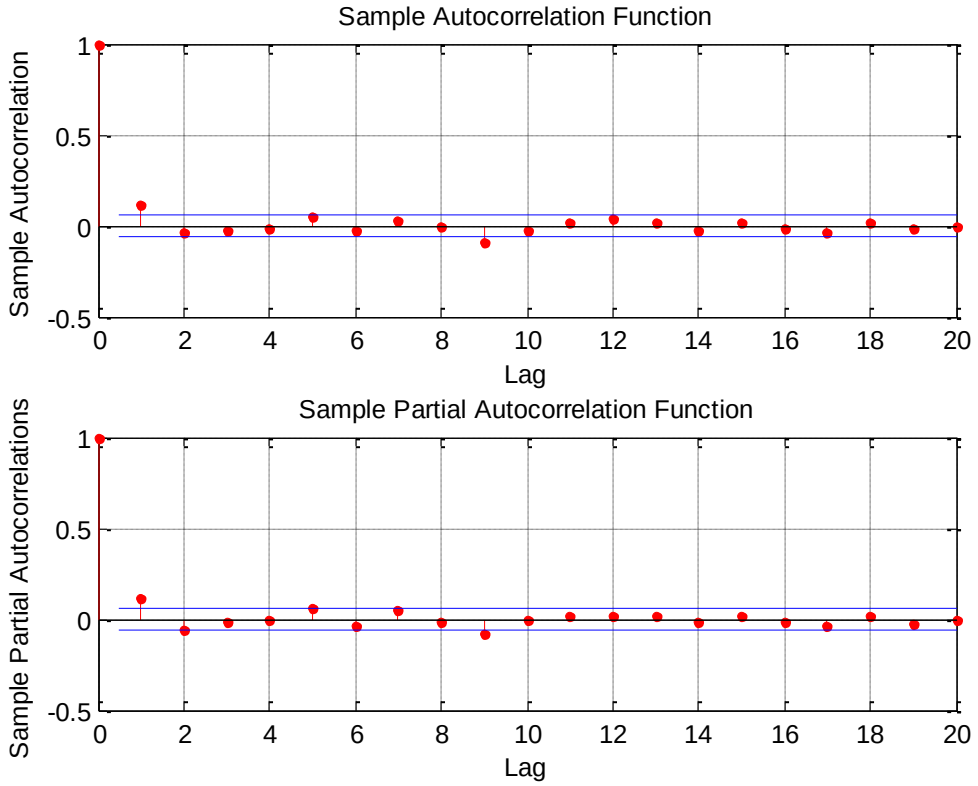
ARCH Test	
H	1
P	0.0086
Fstat	38.0907
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00017498	0.00047765	-0.3663
K	1.4529e-006	7.7572e-007	1.8729
GARCH(1)	0.9633	0.0080695	119.3749
ARCH(1)	0.03176	0.0075196	4.2237
Log Likelihood value	2795.19		



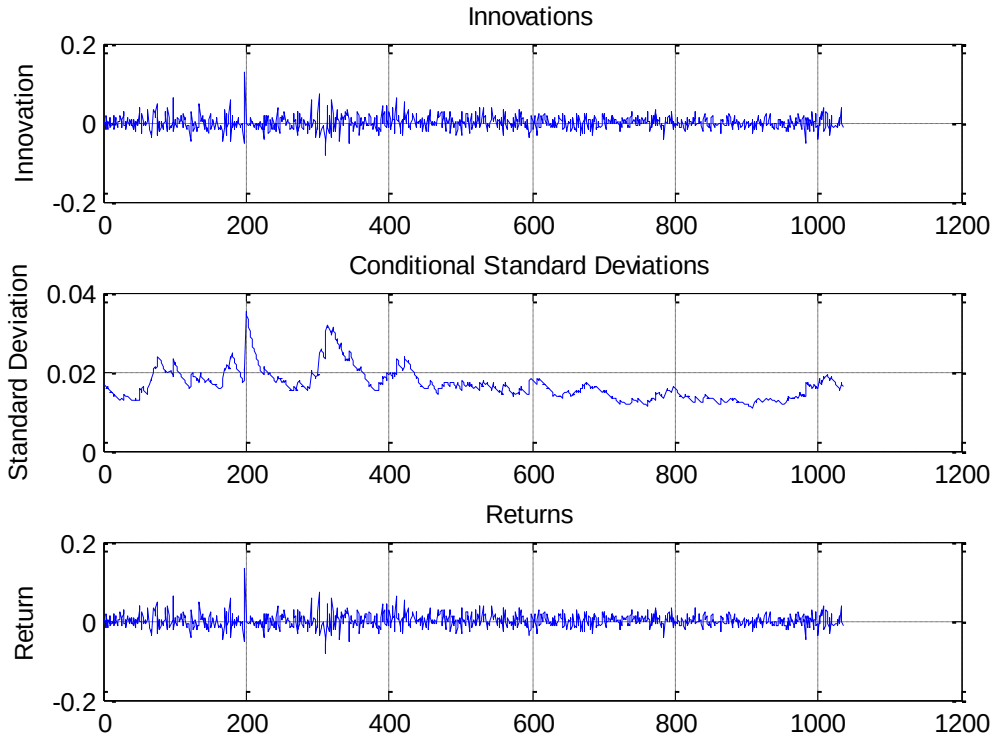
GARCH Comparison	
H	0
P	0.9784

Weichai Power	Weichai Power H



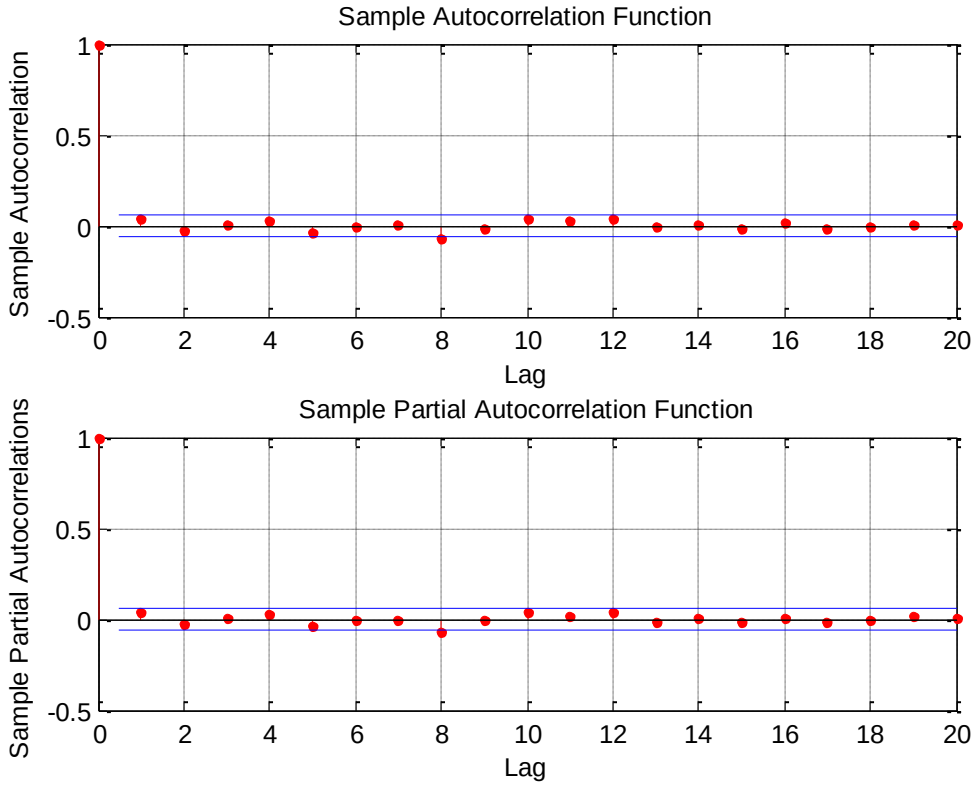
ARCH Test	
H	1
P	9.4733e-004
Fstat	45.4872
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00065253	0.00048138	1.3556
K	3.756e-006	1.7678e-006	2.1248
GARCH(1)	0.93733	0.014907	62.8803
ARCH(1)	0.051317	0.01152	4.4547
Log Likelihood value	2796.95		



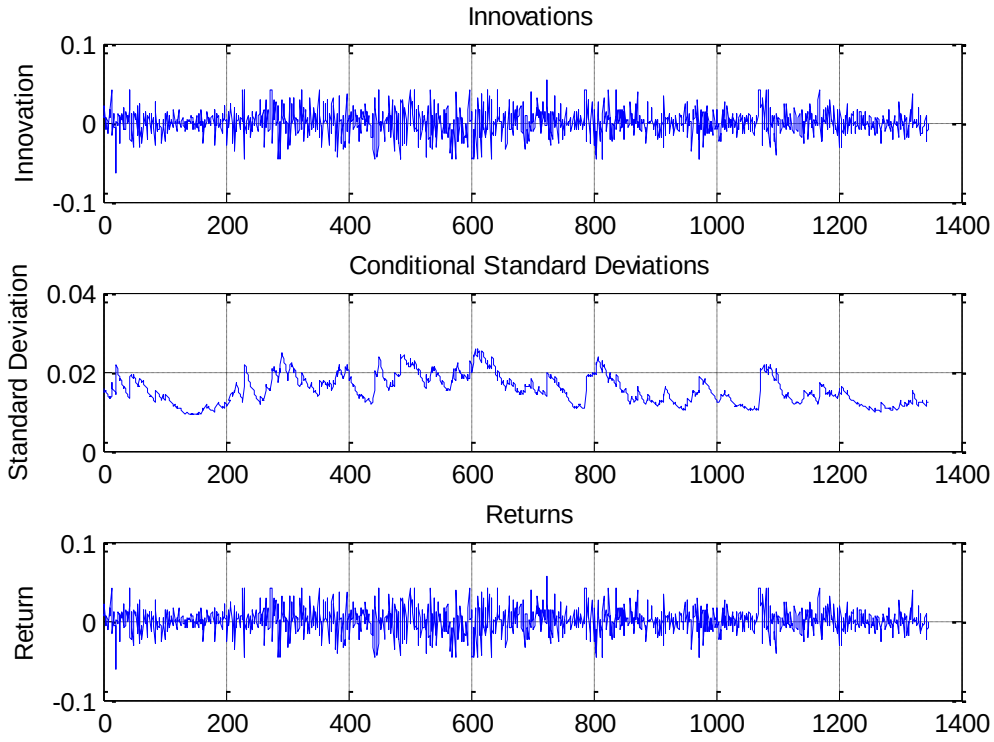
GARCH Comparison	
H	0
P	1

Yanzhou mining	Yanzhou mining A



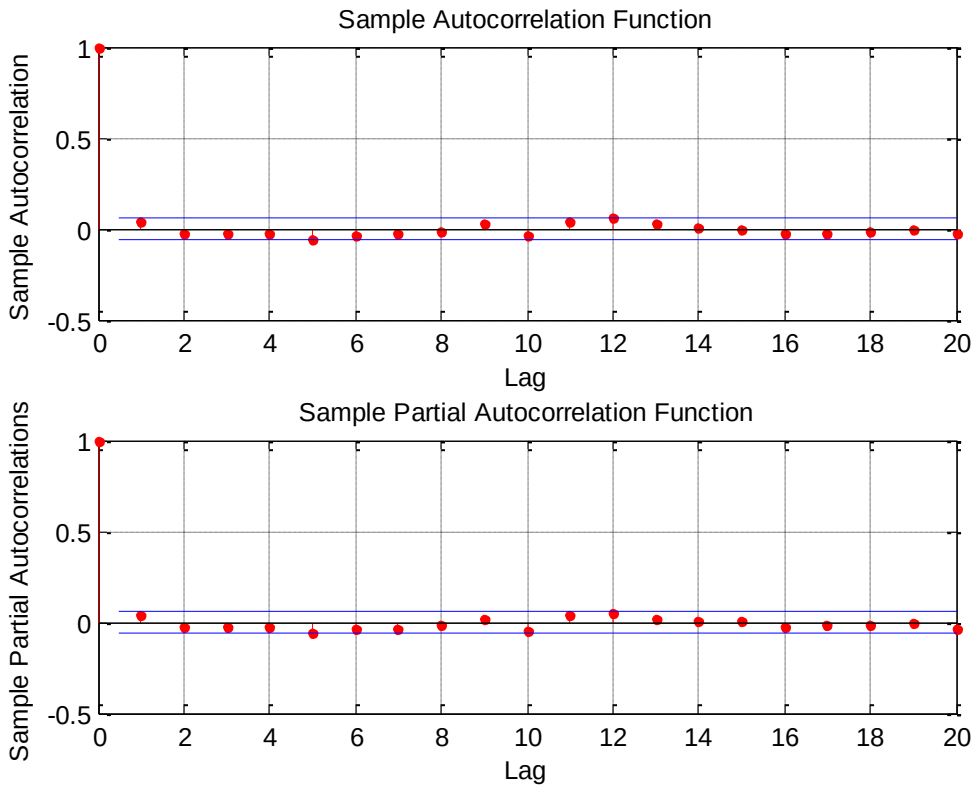
ARCH Test	
H	1
P	1.5335e-011
Fstat	93.8945
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00034587	0.00038981	0.8873
K	5.1648e-006	1.4755e-006	3.5003
GARCH(1)	0.90893	0.014419	63.0384
ARCH(1)	0.071077	0.012114	5.8674
Log Likelihood value	3746.02		



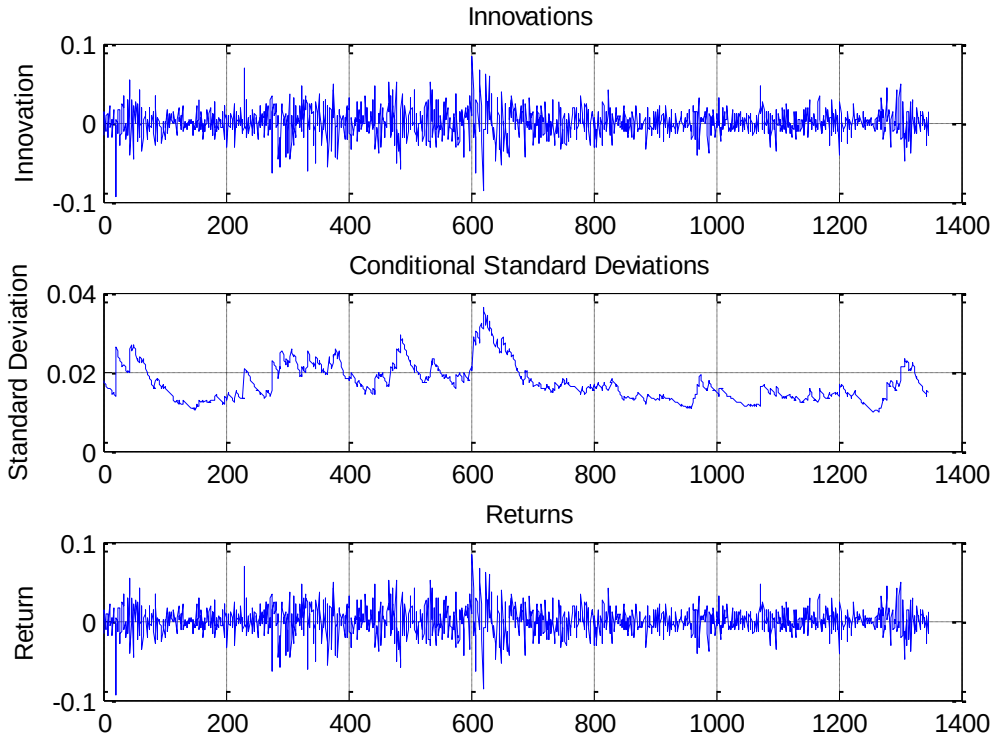
GARCH Comparison	
H	0
P	0.0518

Yanzhou Mining	Yanzhou Mining D



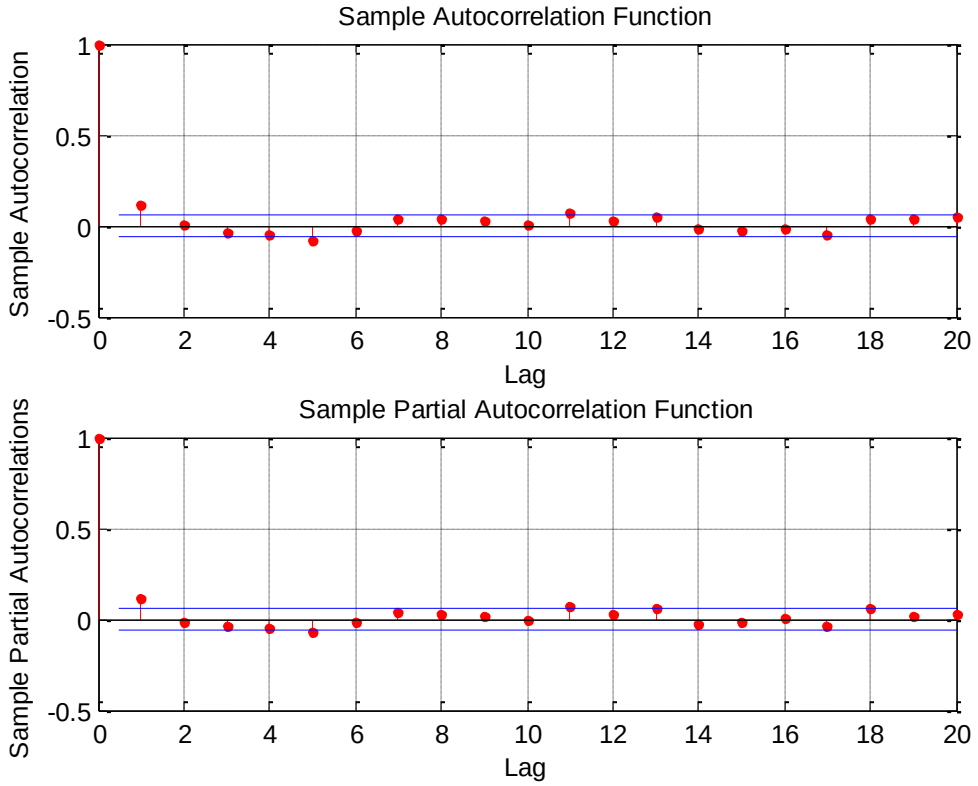
ARCH Test	
H	1
P	0
Fstat	150.1327
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00010072	0.00042062	-0.2395
K	4.9696e-006	1.5063e-006	3.2992
GARCH(1)	0.92527	0.0099271	93.2059
ARCH(1)	0.058485	0.0072763	8.0378
Log Likelihood value	3614.35		



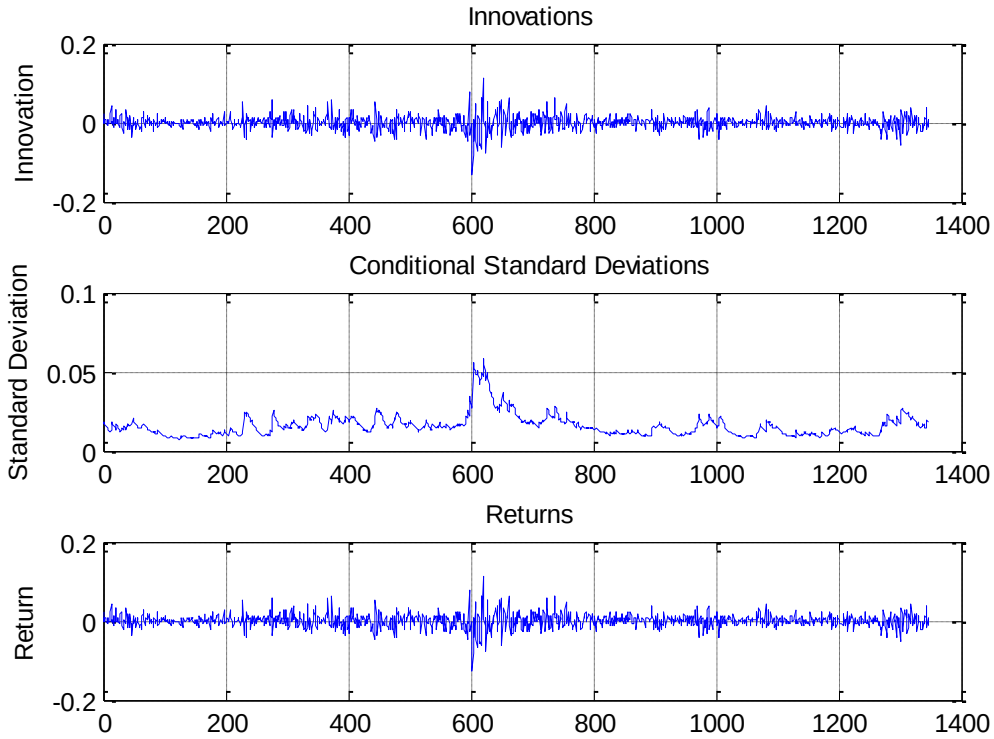
GARCH Comparison	
H	0
P	0.7022

Yanzhou Mining	Yanzhou Mining H



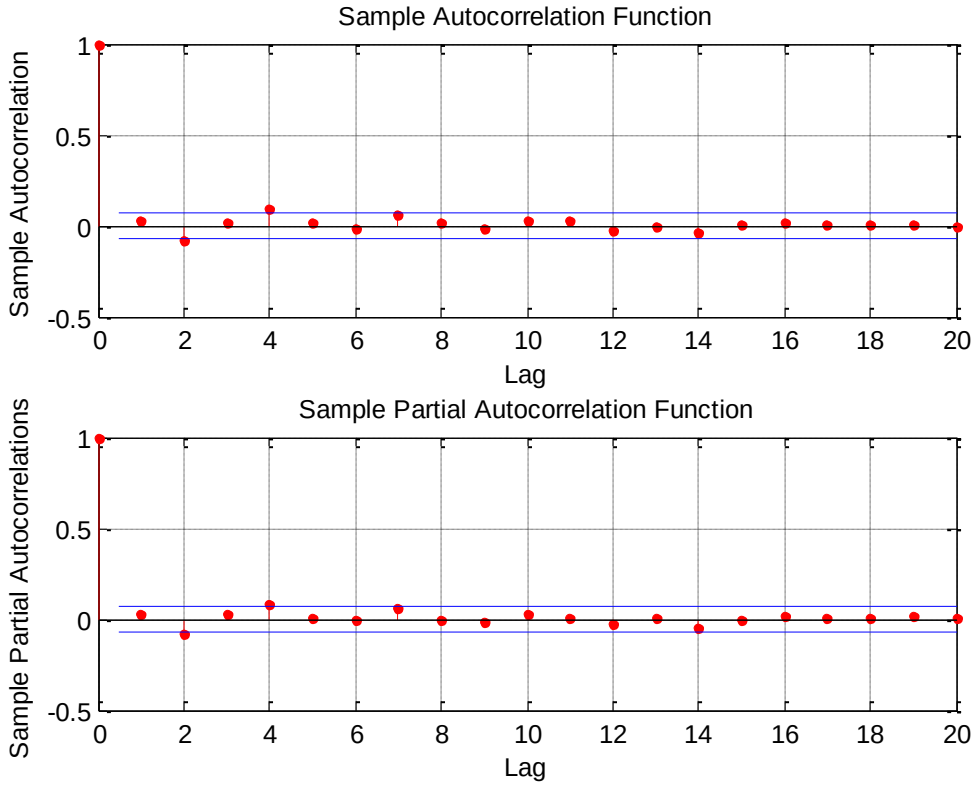
ARCH Test	
H	1
P	0
Fstat	293.3712
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	0.00081972	0.00037489	2.1865
K	4.9119e-006	1.2292e-006	3.9960
GARCH(1)	0.87057	0.016806	51.8020
ARCH(1)	0.11703	0.015539	7.5316
Log Likelihood value	3773.34		



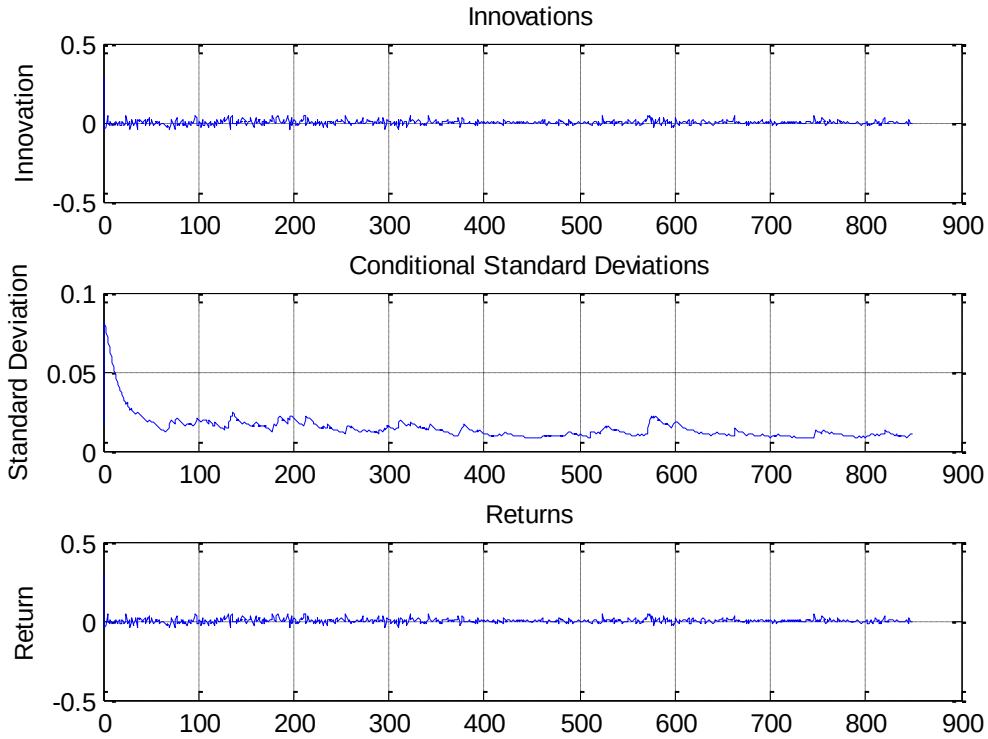
GARCH Comparison	
H	0
P	0.9876

Zijin Mining Group	Zijin Mining Group A



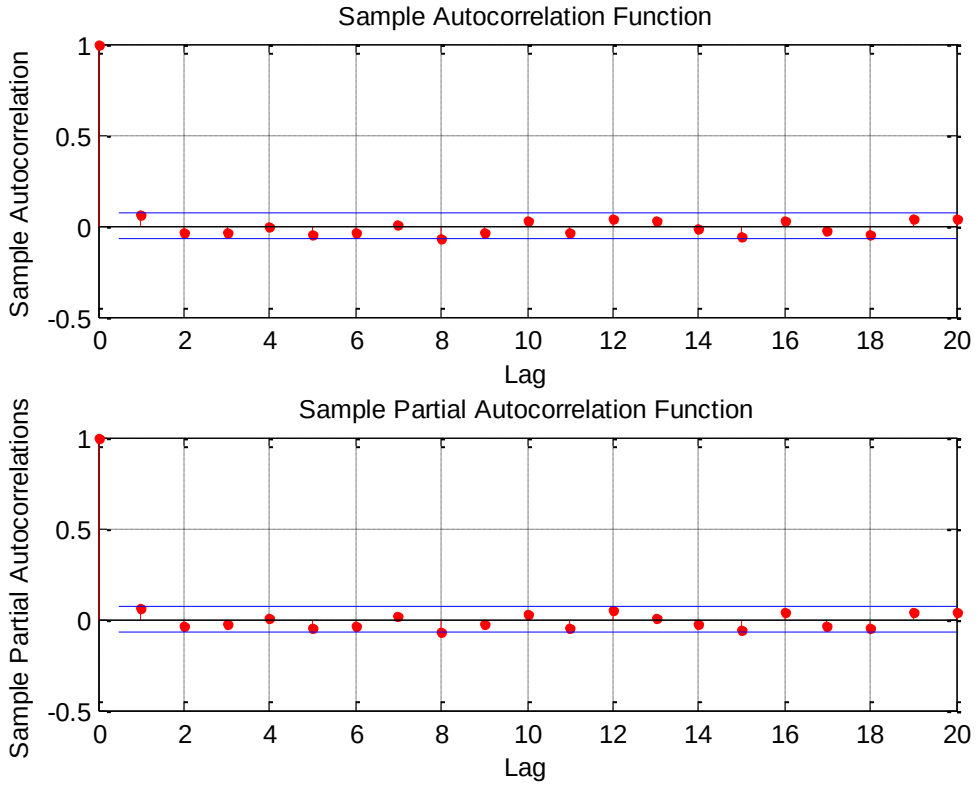
ARCH Test	
H	1
P	1.0361e-009
Fstat	83.3894
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00035073	0.00042797	-0.8195
K	4.5059e-006	9.4446e-007	4.7709
GARCH(1)	0.89992	0.014113	63.7630
ARCH(1)	0.0737	0.012612	5.8438
Log Likelihood value	2335.64		



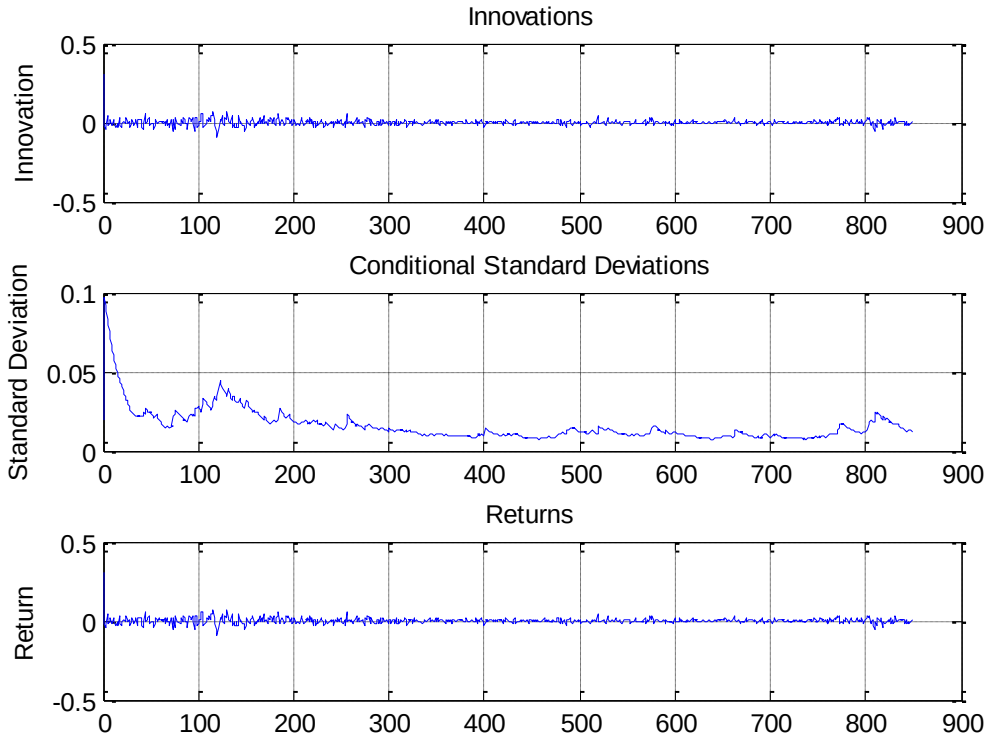
GARCH Comparison	
H	0
P	0.4894

Zijin mining Group	Zijin mining Group D



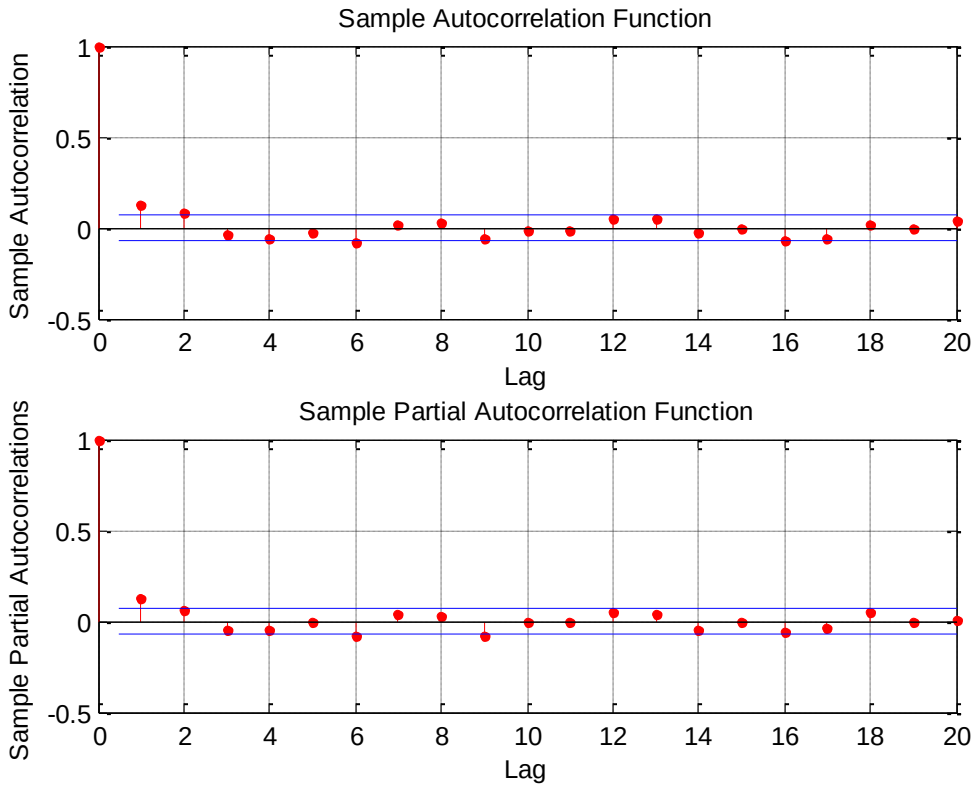
GARCH Comparison	
H	1
P	0
Fstat	190.9924
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	9.4727e-005	0.00038824	0.2440
K	2.8928e-006	1.0167e-006	2.8452
GARCH(1)	0.89077	0.01877	47.4565
ARCH(1)	0.095978	0.018312	5.2412
Log Likelihood value	2309.76		



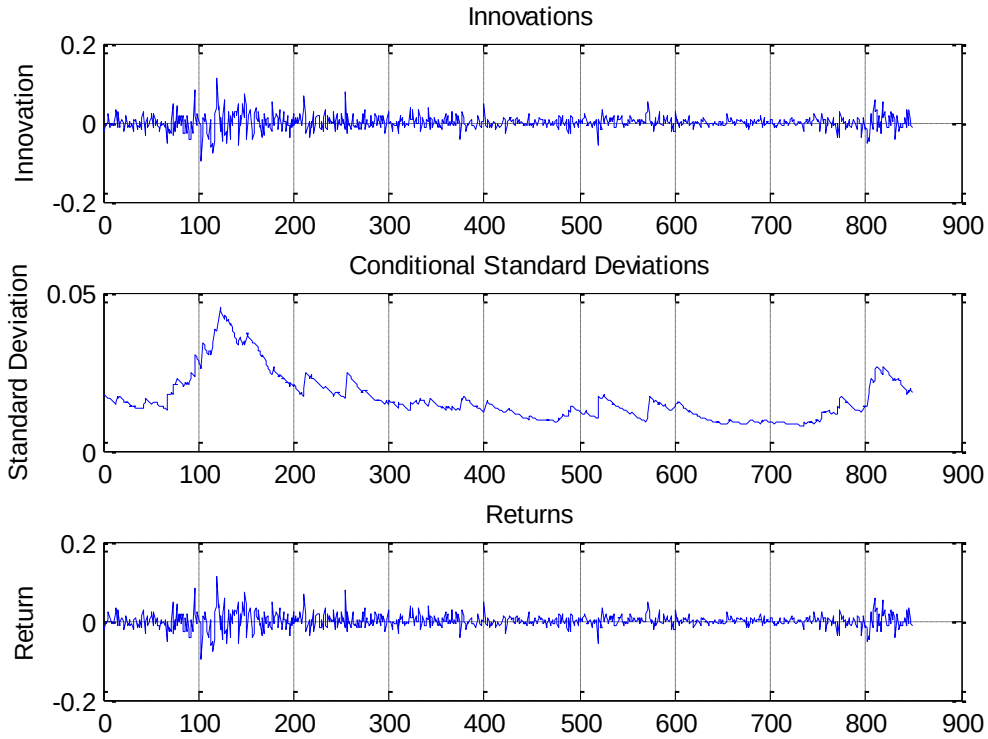
GARCH Comparison	
H	0
P	0.1718

Zijin Mining Group	Zijin Mining Group H



ARCH Test	
H	1
P	0
Fstat	172.7989
Crit	31.4104

GARCH(1,1)			
Conditional Probability Distribution: Gaussian			
Parameter	Value	Error	Statistic
C	-0.00044381	0.00045633	-0.9726
K	1.9491e-006	7.1662e-007	2.7199
GARCH(1)	0.93567	0.0093026	100.5815
ARCH(1)	0.059675	0.0092051	6.4828
Log Likelihood value	2350.04		



GARCH Comparison	
H	0
P	0.6788

Note: there are several tutorials in the Matlab website illustrating how to perform Arch test and GARCH comparisons (www.matlab.com)

Appendix 14 – MDS company name key

Cj	Company name	Cj	Company name
C1	PetroChina	C26	China Construction bank
C2	PingAn	C27	China Cosco
C3	North East Electric	C28	China Eastern Airlines
C4	Anhui conch	C29	China Life
C5	AirChina	C30	China Merchants
C6	Aluminium of China	C31	China oilfield
C7	Angang Steel	C32	China Petroleum
C8	Anhui Highway	C33	China Railway
C9	Bank Of China	C34	China Senhua
C10	Bank of Communications	C35	China Shipping container
C11	Beijing North star	C36	China Shipping Development
C12	North Electric Development	C37	China Southern airlines
C13	Shandong Pharmaceutical	C38	Chongqing Iron & Steel
C14	Shandong Chenming Paper	C39	Datang International
C15	Shenji Group	C40	Dongfang Internaitonal
C16	Shenzhen Expressway	C41	Guanshen International
C17	Sinopec Shanghai	C42	Guangzhou Shipyard
C18	Sinopec Chemical Fibre	C43	Hisense
C19	Tianjin Capital	C44	Hudan Power
C20	Tsingtao Brewey	C45	Huanneng
C21	Weichai Power	C46	ICBC
C22	Yanzhou mining	C47	Jiangsu Expressway
C23	CITIC	C48	Jiangxi Copper
C24	China Coal Energy	C49	Jingwei Textile
C25	Zijin Mining		

Appendix 15 – Major Shareholders

Ping An Major shareholders	
A-share	**Percentage**
Shenzhen Investment	10.06%
Yuan Trust Investment	7.94%
Linzhi Xinhao Shi	6.67%
LZ Jing'ao	5.72%
China Foreign Econ	5.05%
Shun Yip Holdings	3.75%
Shenzhen Wuxin Yufu	3.74%
H-share	**Percentage**
Charoen Pokphand	39.39%
JP Morgan	8. 97%
Diamond Epoch	8.20%
Blackrock	6.95%
Vanguard	3.09%
Jinjun Co	2.43%
FMR	1.61%

China Life Major shareholders	
A-share	**Percentage**
China Life insurance	92.80%
Boshi Group	0.24%
Chansheng Group	0.23%
Dacheng Group	0.15%
China Asset Management	0.14%
Invesco Great Wall	0.11%
Huan Fund Management	0.08%
H-share	**Percentage**
Blackrock	10.50%
Vanguard	5. 11%
Carmignac gestion	1.76%
Hang Seng investment	0.85%
FMR	0.85%
State Street Global	0.83%
Deustche Bank	0.68%

Chalco Major shareholders	
A-share	**Percentage**
Aluminium Corp of China	54.43%
China Cinda Asset Management	8.36%
China Construction Bank	6.89%
Yinhua fund management	0.41%
China Asset Management	0.39%
E Fund Management	0.20%
Harvest Fund	0.20%
H-share	**Percentage**
Franklin	46.17%
Blackrock	5. 32%
Vanguard	5.23%
JP Morgan	3.61%
Templeton	2.61%
Deustche Bank	1.30%

Guangzhou Shipyard shareholders	
A-share	**Percentage**
China State Shipbuilding	52.38%
China Southern Fund	0.78%
BJ ZhongiLianya Real Estate	0.25%
ICBC Credit Suisse	0.13%
China Universal Asset Mgt	0.13%
GF Fund Management	0.10%
Huaan Fund Management	0.06%
H-share	**Percentage**
Mirae Asset Management	2.99%
Baring Asset Management	4. 75%
JPMorgan	4.20%
Atlantis Investment Management	3.75%
Chan Kwok Tai	1.43%
Vanguard	0.84%

PetroChina shareholders		SINOPEC shareholders	
A-share	**Percentage**	**A-share**	**Percentage**
China National Petroleum	97.50%	China Petrochemical Corp	93.94%
Social Security Fund	0.25%	Guotai Junan Securties	0.36%
China Life Insurance	0.08%	China Life Insurance Group	0.16%
Lion Fund Management	0.05%	China Asset Management	0.12%
China Asset Management	0.03%	Harvest Fund Management	0.11%
China Universal Asset Management	0.03%	China Southern Fund	0.10%
Guanxi Investment	0.02%	Huaan Fund Management	0.10%
H-share	**Percentage**	**H-share**	**Percentage**
Franklin Resources	11.88%	Blacrock	11.38%
Blacrock	9. 49%	Franklin Resource	10. 01%
Aberdeen	8.15%	JP Morgan	9.09%
JP Morgan	6.99%	Government of Singapore	4.05%
Vanguard	5.10%	Citigroup	3.83%
Harbor Capital	1.66%	Credit Suisse	2.66%
		Vanguard	2.28%
Shandong Pharma shareholders		**Shenji Group shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Hualu Holding Group	54.05%	Shenyang Group	31.14%
Qingdao Haowei Inv	4.27%	Yunnan Industrial	15.06%
Chang Xin Asset Management	0.04%	Kunmin Jinghhua	3.41%
		China Pacific Insurance	1.50%
		GF Fund	0.12%
		China Southern	0.01%
		ABC-CA Fund	0.01%
H-share	**Percentage**	**H-share**	**Percentage**
Well Bring LTD	9.12%	Hamn Investment	4.96%
Dimensional Fund	0. 59%	Chilton Investment	4. 92%
Zhihai Wang	0.30%	FMR LLC	4.80%
HSIA SIV KUN	0.24%	Dimensional Fund	0.08%
Oppenheirmer Funds	0.03%		

China Eastern Airlines shareholders		***China Southern Airlines shareholders***	
A-share	***Percentage***	***A-share***	***Percentage***
China Eastern Earline Holdings	*62.08%*	*China Suothern Holdings*	*59.10%*
Shanghai Lianhe Investment	*5.49%*	*WH Ruijian Investment Con*	*2.77%*
China National Aviation Fuel	*5.41%*	*AH Conch*	*2.51%*
Jinggiang International Group	*4.41%*	*Xiadong Zhao*	*2.26%*
Harvest Fund Management	*1.36%*	*Bosera funds*	*2.26%*
Aerospace Sci & Tech	*1.27%*	*Ping An Life Insurance*	*2.26%*
Sinotrans Air Transport	*1.07%*	*ZH Xinggang Guarantee*	*2.26%*
H-share	***Percentage***	***H-share***	***Percentage***
CES Global Holding	*55.16%*	*Nan Lung Holding*	*36.98%*
JP Morgan	*10. 10%*	*FMR LLC*	*7. 76%*
JP Morgan Investment	*0.83%*	*JP Morgan*	*4.80%*
FMR LLC	*0.68%*	*Vanguard*	*1.66%*
China International Fund Mgt	*0.51%*	*Yazhou Group*	*1.11%*
Vanguard	*0.45%*	*Blackrock*	*0.95%*
Grantham Mayo Van Otterloo	*0.42%*	*Dimensional Fund*	*0.83%*
NorthEast Electric Development shareholders		***Gunzhou Shipyard shareholders***	
A-share	***Percentage***	***A-share***	***Percentage***
New Northeast Electric Dvp	*31.14%*	*China State Shipbuilding*	*52.38%*
Shenzhen Zhongda	*0.58%*	*China Southern Fund*	*0.78%*
Hu Li	*0.35%*	*BJ Zhongi Lianya Real Estate*	*0.25%*
Wang Qinsheng	*0.33%*	*ICBC Credit Suisse*	*0.13%*
China Investment Sec.	*0.27%*	*China Universal Asset Management*	*0.13%*
Xu Yipin	*0.27%*	*GF Fund Management*	*0.10%*
Wang Dawei	*0.26%*	*Huaan Fund Management*	*0.06%*
H-share	***Percentage***	***H-share***	***Percentage***
HK SEC Clearing	*95.98%*	*Mirae Asset management*	*5.90%*
		Baring Asset Management	*4. 75%*
		JP Morgan	*4.70%*
		Atlantis investment Management	*3.74%*
		Chan Kowk Tai	*1.43%*
		Vanguard	*0.84%*

Air China shareholders		**China merchants shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
NCA Holding Company	63.68%	China Merchants Group	22.00%
NCA Holding Company	15.64%	Shanghai Jian Technology	8.71%
China National Aviation	1.61%	China Ocean Shipping	7.59%
Sinotrans Air Transport	0.89%	China Shipping Group	5.40%
New China Life	0.80%	China Construction	2.17%
Guodian Capital Holding	0.56%	Shanghai Auto Industrial	2.08%
Guohua Life Insurance	0.51%	China Asset Management	1.82%
H-share	**Percentage**	**H-share**	**Percentage**
Cathay Pacific Airways	55.30%	Franklin Resources	21.77%
China National Aviation	4.91%	Blackrock	13.09%
FMR LLC	1.38%	JP Morgan	9.50%
Vanguard	1.14%	Vanguard	5.22%
Matthws International	0.95%	Commonwealth Bank	3.15%
Blackrock	0.94%	Deustche Bank	2.42%
Invesco	0.93%	Thornburg Invest	1.74%
Shandong Chenming Paper shareholders		**China COSCO shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Shongnang Chenming Holding	26.32%	China Ocean Shipping	69.58%
Gates Foundation	1.48%	Sociual Security Fund	2.34%
Hongguo Chen	0.57%	China Southern Fund	1.13%
Tongyuan Yin	0.29%	China National N	0.94%
China Southern Fund	0.23%	UBS SDIC	0.65%
CITIC Prudential	0.18%	Sinochem Corp	0.52%
GF Fund Management	0.16%	China Aerospace Science	0.52%
H-share	**Percentage**	**H-share**	**Percentage**
Social Security Fund	9.09%	Blackrock	5.16%
Zhong Hang HL Invest	8.53%	Credit Suisse	3.78%
FMR LLC	5.09%	JP Morgan	3.66%
Keywise Capital	4.98%	Vanguard	2.67%
Invesco HK	4.95%	Dimensional Fund	1.70%
Schroder Investments	4.75%	Morgan Stanley	1.27%
Value Partners	4.45%		

Shenzhen Expressway shareholders	
A-share	**Percentage**
Shenzhen International	45.68%
Shenzhen Shengnangwei	28.71%
Huajian Transportation	6.08%
Guangdong road & nbridge	4.32%
Huaahn Fund Management	0.54%
Ping An	0.34%
China Asset Management	0.28%
H-share	**Percentage**
JP Morgan	7.17%
Franklin Resources	6.87%
Alli8anz	5.54%
Veritas	5.35%
UBS	4.97%
FMR LLC	4.95%
Invesco LTD	3.24%

Sinopec Chemical shareholders	
A-share	**Percentage**
China Petroleum & Company	64.62%
CITIC Group	27.69%
China International Fund	1.20%
China Life Insurance	0.24%
Chen Zhanghua	0.06%
Lin Youming	0.06%
China Universal Asset Management	0.03%
H-share	**Percentage**
Invesco	4.70%
Vanguard	1.00%
Dimensional	0.32%
Shuinhan BNP Paribas	0.24%
Eaton Vance	0.23%
Claymore Advisors	0.16%
Bank of NY Mellon	0.12%

China Shipping Container shareholders	
A-share	**Percentage**
China Shipping Group	67.60%
Yinhua Fund Management	0.64%
China Asset Management	0.57%
Fullgoal Fund Management	0.52%
Baoying Fund Management	0.26%
Soochow Asset Management	0.18%
Harvest Fund	0.16%
H-share	**Percentage**
Blackrock	8.78%
Deustche Bank	4.84%
Earnest Partners	4.76%
Vanguard	2.65%
Dimensional Fund	1.93%
FMR LLC	1.91%

China Shipping Dev shareholders	
A-share	**Percentage**
China Shipping Group	74.86%
UBS SDIC Fund	0.39%
Fortune SGAM Fund	0.32%
Lion Fund	0.29%
Shanxi Securities	0.18%
Yinhe Jinxing	0.17%
China Pacific Life	0.14%
H-share	**Percentage**
JP Morgan	12.44%
Blackrock	8.82%
Prudential PLC	7.98%
Government of Singapore Inv.	4.99%
Schroder Inv.	4.99%
Barings Asset Management	4.91%

Beijing Printing Machinery shareholders		**Angang Steel shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Beijing Jincheng Machinery	62.61%	Anshan Iron & Steel	79.18%
CITIC Trust	0.94%	Yinhua Fund Management	1.07%
China Foreign Economic Trade	0.70%	E Fund	0.59%
Rising Securities	3.67%	Rongtong Fund Management	0.29%
Zhong Chunming	0.64%	Harvest Fund Management	0.23%
Zhan Chunxin	0.37%	Li Yulan	0.21%
Asshmore Greater China	0.34%		
H-share	**Percentage**	**H-share**	**Percentage**
Rostchild	4.82%	Blackrock\	9.30%
Tai Chan Kwok	0.56%	JP Morgan	6.29%
		Citigroup Inc	6.25%
		Government of Singapore Inv.	5.95%
		Wellington Management	4.83%
		FMR LLC	4.76%
		Ccredit Suisse	4.06%
Maanshan Iron & steel shareholders		**Jiangxi Copper shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Ma gang Group	65.12%	Jiangxi Copper	64.09%
Penghua Fund	0.76%	China Asset Management	0.76%
Cihna International Fund	0.14%	GF Fund Management	0.71%
BOCI Fist Life Insurance	0.13%	Dacheng Fund Management	0.55%
BOSHI Fund Management	8.04%	Yinhua Fund Management	0.50%
China Universal Asset Management	0.03%	E Fund Mgt	0.36%
Dimensional Fund	0.03%	Fullgoal Fund	0.33%
H-share	**Percentage**	**H-share**	**Percentage**
Sun Life Financial	5.53%	Blackrock	8.27%
FMR LLC	5. 44%	Deustche Bank	4. 88%
Deustche Bank	4.95%	JP Morgan	4.76%
Citigroup	4.69%	Franklin Resources	3.01%
Dimensional Fund	2.35%	Vanguard Group	2.71%
		Shinhan BNP Paribas	1.79%

Huaneng Power shareholders		**Jiangsu Expressway shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Huaneng International Power	48.25%	Jiangsu CMNS Holdings	71.88%
China Huaneng Group	14.81%	Huajian Transportation	15.44%
Hebei Provinvial Const	5.74%	Huaxia Securities	0.55%
Liaoning Energy	4.03%	Morgan Stanley	0.41%
Jiangsu Investment	3.97%	Shenyin & Wanguo	0.37%
Fujian Investment	3.57%	Boshi Fund Mgt	0.18%
Dalian Construction	2.87%	Lombarda China Fund	0.07%
H-share	**Percentage**	**H-share**	**Percentage**
China Huanneng Group	13.96%	Blackrock	10.57%
Blackrock	8.69%	Mondrain Investment	8.04%
HSBC Global Asset Management	4.85%	Matthews International	7.08%
Vanguard	2.48%	JP Morgan	5.88%
Capital Group	2.24%	Macquarie	5.26%
FMR LLC	1.22%	Desutche Bank	4.90%
PICTET	1.09%	Bank of NY Mellon	4.43%
Sinopec Petrochem shareholders		**Tianjin Capital shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
China Petroleum & Chemical	82.14%	Tianjin Municipal Investment	67.74%
China International Fund	1.39%	Jun Zhou	0.57%
China /Life Insurance	0.57%	ABC	0.34%
SYWG BNP Paribas	0.43%	Shanyang Railway	0.28%
Shanghai Kangli	0.34%	Golden Sun Securities	0.19%
Zhejinag Economic Cons	0.25%	China Southern Fund	0.12%
New China Fund	0.07%	China Electronics	0.10%
H-share	**Percentage**	**H-share**	**Percentage**
Blackrock	9.27%	HSBC Asset Management	5.88%
HSBC Global Asset Management	4.83%	ISIS AM	5.08%
Government of Singapore Inv.	4.70%	Xi Lian International	4.32%
Citigroup[	4.28%	Invesco	1.69%
Vanguard	2.61%	Vanguard	0.89%
GAM International	2.28%	Dimensional	0.82%

China Coal Energy shareholders		China Oil Field shareholders	
A-share	**Percentage**	**A-share**	**Percentage**
China National Coal Group	82.04%	China National Coal Group	82.04%
Yinhua Fund Management	0.34%	Yinhua Fund Management	0.34%
China Asset Management	0.26%	China Asset Management	0.26%
Dacheng Fund	0.20%	Dacheng Fund	0.20%
CCB Principal	0.17%	CCB Principal	0.17%
CSOP Asset Mnagement	0.15%	CSOP Asset Mnagement	0.15%
Harvest Fund	0.12%	Harvest Fund	0.12%
H-share	**Percentage**	**H-share**	**Percentage**
Blackrock	13.39%	Blackrock	13.39%
Government of Singapore Inv.	7. 32%	Government of Singapore Inv.	7. 32%
Citigroup Inc	5.80%	Citigroup Inc	5.80%
JP Morgan	5.71%	JP Morgan	5.71%
Morgan Stanley	4.11%	Morgan Stanley	4.11%
Davis Selected Adv.	2.98%	Davis Selected Adv.	2.98%
Vanguard	2.72%	Vanguard	2.72%
Weichai Power shareholders		**Yanzhou Mining shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
SD Heavy Industry	22.23%	Yan Kuang Group Co	87.84%
Peterson Holdings	10.91%	Yinhua Fund	0.42%
Shenzhen Capital	5.45%	China Asset Management	0.29%
Fujian Longyan	5.45%	Soochow Asset Mgt	0.21%
Weifang Invest	4.90%	Fullgoal	0.15%
Yeung Sai Hong	4.17%	E Fund	0.14%
		Harvest Fund Management	0.12%
H-share	**Percentage**	**H-share**	**Percentage**
Lazard Asset Management	19.14%	Franklin Resources	38.69%
Brandes Investment	16. 18%	JP Moprgan	9. 07%
JP Morgan	8.23%	BNP	6.01%
Schroeder	8.00%	Deustche	5.44%
Capital Group	6.84%	Blackrock	4.89%
Lone Pinbe	4.81%	Morgan Stanley	3.22%
Eanest Partners	4.76%		

China Railway shareholders		China Shenhua shareholders	
A-share	**Percentage**	**A-share**	**Percentage**
China Railway Coonstruction	73.74%	Shenhua Group Corp	88.06%
Social Security Fund	2.83%	Hua An Fund	0.33%
Chang Sheng Fund	0.49%	China Asset Management	0.25%
Fullgoal Fund	0.26%	Yinhua Fund	0.20%
Boshi Fund Management	0.24%	E Fund	0.19%
UBS	0.23%	Harcest Fund Management	0.19%
Harvest Fund Management	0.22%	Great Wall Fund Management	0.16%
H-share	**Percentage**	**H-share**	**Percentage**
Social Security Fund	9.09%	Blackrock	12.45%
Blackrock	6.14%	JP Morgan	10.60%
HSBC Global Asset Maangement	5.03%	Vanguard	3.04%
Capital Group	4.92%	Franklin Resources	1.60%
Baillie Gifford	4.79%	FMR LLC	1.09%
JP Morgan	4.53%	Oppenheirmer Funds	1.02%
		Mattews International	1.01%
Guangzhou Pharma shareholders		**Hisense shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
Guangzhou Pharma Holding	66.13%	Qingdao Hisense Air Conditioning	68.46%
GS Beichen rural credi9t	6.13%	China Huarong	4.18%
GZ Xinjiao Rural Credit	0.55%	Zhang Shaown	0.68%
Rongtong Fund Management	0.36%	Cheng Jinyang	0.25%
Invesco	0.32%		
Lion Yong	0.29%		
Manulife	0.25%		
H-share	**Percentage**	**H-share**	**Percentage**
Keywise Capital Management	5.00%	Hisense HK CO LTD	11.75%
FMR LLC	4.91%	Hillhouse Capital Management	6.27%
Deustche Bank	4.49%	Citigroup	4.98%
ChinaSouthern Fund Management	3.87%	Value Partners	4.58%
Fidelity	1.95%	China Asset Management	2.18%
Dimensional; Fund Advisory	0.93%	OSK UOB Trust	0.69%

Anhui Conch shareholders		Beijing North Star shareholders	
A-share	**Percentage**	**A-share**	**Percentage**
Anhuii Conch Holdings	48.69%	Beijing North Star Industrial Corp	43.65%
Anhui Conch Venture	7.17%	Beijing Wang Fujing Dep. Store	5.15%
Ping An Trust	1.86%	ZH Xingang guarantee	2.77%
Huaan Fund Management	1.19%	China Asset Management	1.11%
Dacheng Fund Management	1.14%	China Merchants Securities	1.09%
Harvest Fund	1.13%	Zhejiang haiyue	1.02%
Boshi Fund	1.07%	Hui Chen	0.93%
H-share	**Percentage**	**H-share**	**Percentage**
JP Morgan	15.58%	Dimensional Fund	1.77%
Blackrock	13.41%	Vanguard	0.73%
Genesis Asset Management	10.02%	CB - Accent Lux Sicav	0.25%
Taiwan Cement Corp	8.97%	Dimensional Fund	0.24%
Morgan Stanley	5.21%	Eaton Vance	0.22%
Deustche Bank	4.39%	Northern Trust	0.09%
		Blackrock	0.07%
CITIC shareholders		**Datang International shareholders**	
A-share	**Percentage**	**A-share**	**Percentage**
CITIC Group	23.42%	China Datang Corporation	41.83%
china Life Insurance	7.00%	Tianjin Jinneng Investment	13.25%
Yinhua Fund Management	1.14%	Hebei Provincia; Const	12.90%
China Academy Vehicle	1.08%	Beijing Energy Investment	12.93%
Nanjing Xinggan	0.93%	Dognfang Electric	2.43%
Bank of Communications	0.83%	Harbin Power Equipment	2.02%
Harvest Fund Management	0.75%	Aerospace IFIN	1.71%
H-share	**Percentage**	**H-share**	**Percentage**
Blackrock	9.51%	China Datang Overseas	14.50%
JP Morgan	8.15%	Blackrock	3.44%
Temasek	7.46%	Trothschild	4.91%
Citigroup	7.05%	Deustche Bank	4.89%
Social Security Fund	6.93%	Vanguard	2.49%
Lkazard Asset Management	5.24%	Bank of NY Mellon	0.86%
Banco BTG	4.98%		

ZTE Corporation shareholders	
A-share	**Percentage**
Shenzh Zhongx	37.65%
China Life Insurance	4.87%
CITIC Trust	2.07%
E Fund Man	1.82%
Hunan Nantian	1.33%
Rongton Fund	1.19%
Yinhua Fund	1.17%
H-share	**Percentage**
Capital Group	17.15%
Wellington Manag	7.45%
Blackrock	7.01%
Deustche Bank	6.96%
JP Morgan	5.71%
FMR LLC	

Zijin Mining shareholders	
A-share	**Percentage**
Minxi xinghang	39.97%
New Huadu	15.51%
Xiamen Hengxing	3.23%
Xiping Ke	2.38%
Shanhang County	1.62%
ChenJinghe	0.84%
China Universal AM	0.67%
H-share	**Percentage**
Blackrock	7.55%
HSBC	4.92%
JP Morgan	4.37%
Vanguard	2.64%
Royal Bank of Canada	1.59%
Schroder Inv.	0.94%

Jingwei Textile shareholders	
A-share	**Percentage**
China tectile Machinery	41.88%
Tianjin Trust	6.14%
Minsheng Jiayinxin	4.87%
China Hengtian Group	3.69%
Ping An Trust	1.67%
HFT Invest	1.59%
China Asset Management	1.15%
H-share	**Percentage**
HK SEC Clearing Co	99.47%
Dimensional Fund	0.87%
Vangtuard	0.50%
HFT Investment	0.39%
Dimensional Fund	0.13%
Bessemer	0.05%
Nomura International	0.04%

Source: Data from Bloomberg

Appendix 16 - Central Limit Theorem

The central limit theorem is perhaps one of the most important theorems in statistics [Mether] and in simple terms means that:

> *“ the mean and the sum of a random sample of a large enough size1 from an (essentially) arbitrary distribution have approximately normal distribution: Given a random sample X1, . . . ,Xn with μ = E(Xi) and _2 = Var(Xi)”*
>
> *Source: Hildebrand*

The CTL theorem is important because enables to make assumptions about the properties of a population regardless of this population following a normal distribution or not.

Appendix 17 – Normal Distribution

Company	Ticker	Kolmogorov Smirnov	Lilie Test	
			H	P
JINTAI FUND	500001	1	1	<0.001
TAIHE FUND	500002	1	1	<0.001
HANSHENG FUND	500005	1	1	<0.001
ANSHUN FUND	500009	1	1	<0.001
JINXIN FUND	500011	1	1	<0.001
XINGHE FUND	500018	1	1	<0.001
YINFENG SECURITY INVEST FUND	500058	1	1	<0.001
BCOMM SCHRODER SSE180 ETF	510010	1	1	<0.001
BOSERA SSE LARGE CAP ETF	510020	1	1	<0.001
SSE 180 VALUE ETF	510030	1	1	0.0064
CHINA 50 ETF	510050	1	1	<0.001
ICBC CRED SUISSE CENT 50 ETF	510060	1	1	<0.001
SSE PRIVATE-OWNED ENTER ETF	510070	1	0	0.0619
CCB SOC RESPONSIBILITY ETF	510090	1	1	<0.001
SSE PERIODICAL INDUST 50 ETF	510110	1	1	0.0074
SSE NON-CYCLICAL 100 ETF	510120	1	0	0.3658
E FUND SSE MID-CAP ETF	510130	1	0	0.2173
CHINA MERCH SSE CONSUMER ETF	510150	1	0	0.1805
CHINA SECURITY SOUTHERN ETF	510160	1	1	<0.001
GTJA ALLIANZ SSE CMDY EQ ETF	510170	1	0	0.0850
SHANGHAI SSE180 ETF	510180	1	1	<0.001
HUAAN SSE IND TOP INDEX ETF	510190	1	1	0.0011
FULLGOAL SCI INDEX ETF	510210	1	1	0.0111
HUATAI-PIN SSE MED-SMALL ETF	510220	1	0	0.1413
GUOTAI SHANGHAI 180 FIN ETF	510230	1	1	0.0056
LION SSE EMERGING INDUST ETF	510260	1	0	0.2208
BANK OF CHINA SSE EN 100 ETF	510270	1	1	0.0190
FORTUNE SGAM SSE 180 GRO ETF	510280	1	0	0.5000
CHINA SOUTHERN SSE 380 ETF	510290	1	0	0.5000
HUATAI-PB SSE DIVIDEND ETF	510880	1	1	<0.001
SHANGHAI PUDONG DEVEL BANK-A	600000	1	1	<0.001
GUANGZHOU BAIYUN INTERNATI-A	600004	1	1	<0.001
WUHAN IRON & STEEL CO LTD-A	600005	1	1	<0.001
DONGFENG AUTOMOBILE CO LTD-A	600006	1	1	<0.001
CHINA WORLD TRADE CENTER-A	600007	1	1	<0.001
BEIJING CAPITAL CO LTD-A	600008	1	1	<0.001
SHANGHAI INTERNATIONAL AIR-A	600009	1	1	<0.001
INNER MONGOLIAN BAOTOU STE-A	600010	1	1	<0.001
HUANENG POWER INTL INC-A	600011	1	1	<0.001
ANHUI EXPRESSWAY CO LTD-A	600012	1	1	<0.001
HUAXIA BANK CO LTD-A	600015	1	1	<0.001
CHINA MINSHENG BANKING-A	600016	1	1	<0.001
RIZHAO PORT CO LTD -A	600017	1	1	<0.001
SHANGHAI INTERNATIONAL POR-A	600018	1	1	<0.001
BAOSHAN IRON & STEEL CO-A	600019	1	1	<0.001
HENAN ZHONGYUAN EXPRESSWAY-A	600020	1	1	<0.001
SHANGHAI ELECTRIC POWER CO-A	600021	1	1	<0.001

Company	Ticker	Kolmogorov Smirnov	Lilie Test	
			H	P
ZHEJIANG WHWH INDUSTRY CO-A	600576	1	1	<0.001
TONGLING JINGDA SPECIAL-A	600577	1	1	<0.001
BEIJING JINGNENG THERMAL-A	600578	1	1	<0.001
QINGDAO YELLOW SEA RUBBER -A	600579	1	1	<0.001
WOLONG ELECTRIC GROUP CO L-A	600580	1	1	<0.001
XINJIANG BA YI IRON & STEE-A	600581	1	1	<0.001
TIAN DI SCIENCE & TECHNOLO-A	600582	1	1	<0.001
OFFSHORE OIL ENGINEERING-A	600583	1	1	<0.001
JIANGSU CHANGJIANG ELECTRO-A	600584	1	1	<0.001
ANHUI CONCH CEMENT CO LTD-A	600585	1	1	<0.001
SHANDONG JINJING SCIENCE-A	600586	1	1	<0.001
SHINVA MEDICAL INSTRUMENT-A	600587	1	1	<0.001
YONYOU SOFTWARE CO LTD-A	600588	1	1	<0.001
GUANGDONG RONGTAI IND-A	600589	1	1	<0.001
TELLHOW SCI-TECH CO LTD-A	600590	1	1	<0.001
FUJIAN LONGXI BEARING (GRO-A	600592	1	1	<0.001
GUIZHOU YIBAI PHARMACEUTIC-A	600594	1	1	<0.001
HENAN ZHONGFU INDUSTRY CO-A	600595	1	1	<0.001
ZHEJIANG XINAN CHEMICAL-A	600596	1	1	<0.001
BRIGHT DAIRY & FOOD CO LTD-A	600597	1	1	<0.001
HEILONGJIANG AGRICULTURE-A	600598	1	1	<0.001
PANDA FIREWORKS GROUP CO L-A	600599	1	1	<0.001
TSINGTAO BREWERY CO LTD-A	600600	1	1	<0.001
FOUNDER TECHNOLOGY GROUP -A	600601	1	1	<0.001
INESA ELECTRON CO LTD-A	600602	1	1	<0.001
SHANGHAI XINGYE HOUSING-A	600603	1	1	<0.001
SHANGHAI ERFANGJI TEXTILE-A	600604	1	1	<0.001
SHANGHAI LIGHT INDUS MACH-A	600605	1	1	<0.001
SHANGHAI JINFENG INVEST-A	600606	1	1	<0.001
SHENYANG JINBEI AUTOMOTIVE-A	600609	1	1	<0.001
CHINA TEXTILE MACHINERY-A	600610	1	1	<0.001
DAZHONG TRANSPORTATION GRP-A	600611	1	1	<0.001
LAO FENG XIANG CO LTD-A	600612	1	1	<0.001
SHANGHAI WINGSUNG INVESTME-A	600613	1	1	<0.001
SHANGHAI DINGLI TECHNOLOGY-A	600614	1	1	<0.001
SHANGHAI FENGHWA GROUP CO-A	600615	1	1	<0.001
SHANGHAI JINFENG WINE CO L-A	600616	1	1	<0.001
SHANGHAI LIANHUA FIBRE-A	600617	1	1	<0.001
SHANGHAI CHLOR-ALKALI CHEM-A	600618	1	1	<0.001
SHANGHAI HIGHLY GROUP CO-A	600619	1	1	<0.001
SHANGHAI TIANCHEN CO LTD -A	600620	1	1	<0.001
SHANGHAI JINLING CO LTD-A	600621	1	1	<0.001
SHANGHAI JIABAO IND & COMM-A	600622	1	1	<0.001
DOUBLE COIN HOLDINGS LTD-A	600623	1	1	<0.001
SHANGHAI FUDAN FORWARD S &-A	600624	1	1	<0.001
SHANGHAI SHENDA CO LTD-A	600626	1	1	<0.001
SHANGHAI NEW WORLD CO LTD-A	600628	1	1	<0.001

SHANDONG IRON AND STEEL CO-A	600022	1	1	<0.001
CHINA SHIPPING DEVELOPMENT-A	600026	1	1	<0.001
HUADIAN POWER INTL CORP-A	600027	1	1	<0.001
CHINA PETROLEUM & CHEMICAL-A	600028	1	1	<0.001
CHINA SOUTHERN AIRLINES CO-A	600029	1	1	<0.001
CITIC SECURITIES CO-A	600030	1	1	<0.001
SANY HEAVY INDUSTRY CO LTD-A	600031	1	1	<0.001
FUJIAN EXPRESSWAY DEVELOPM-A	600033	1	1	<0.001
HUBEI CHUTIAN EXPRESSWAY-A	600035	1	1	<0.001
CHINA MERCHANTS BANK-A	600036	1	1	<0.001
BEIJING GEHUA CATV NETWORK-A	600037	1	1	<0.001
HAFEI AVIATION INDUSTRY CO-A	600038	1	1	<0.001
SICHUAN ROAD&BRIDGE CO LT-A	600039	1	1	<0.001
POLY REAL ESTATE GROUP CO -A	600048	1	1	<0.001
CHINA UNITED NETWORK-A	600050	1	1	<0.001
NINGBO UNITED GROUP CO LTD-A	600051	1	1	<0.001
ZHEJIANG GUANGSHA CO LTD-A	600052	1	1	<0.001
JIANGXI ZHONGJIANG REAL EA-A	600053	1	1	<0.001
HUANGSHAN TOURISM DEVELOP-A	600054	1	1	<0.001
CHINA RESOURCES WANDONG ME-A	600055	1	1	<0.001
CNTIC TRADING CO LTD-A	600056	1	1	<0.001
FUJIAN XIAMEN XIANGYU CO L-A	600057	1	1	<0.001
MINMETALS DEVELOPMENT CO-A	600058	1	1	<0.001
ZHEJIANG GUYUELONGSHAN SHA-A	600059	1	1	<0.001
HISENSE ELECTRIC CO LTD-A	600060	1	1	<0.001
SINOTEX INVESTMENT & DEVEL-A	600061	1	1	<0.001
CHINA RESOURCES DOUBLE CRA-A	600062	1	1	<0.001
ANHUI WANWEI UPDATED HIGH-A	600063	1	1	<0.001
NANJING XINGANG HIGH TECH-A	600064	1	1	<0.001
ZHENGZHOU YUTONG BUS CO -A	600066	1	1	<0.001
CITICHAMP DARTONG CO LTD-A	600067	1	1	<0.001
CHINA GEZHOUBA GROUP CO LT-A	600068	1	1	<0.001
HENAN YINGE INDUSTRIAL INV-A	600069	1	1	<0.001
ZHEJIANG FURUN CO LTD-A	600070	1	1	<0.001
PHENIX OPTICAL CO LTD-A	600071	1	1	<0.001
JIANGNAN HEAVY INDUSTRY CO-A	600072	1	1	<0.001
JIANGSU ZHONGDA NEW MATERI-A	600074	1	1	<0.001
XINJIANG TIANYE CO-A	600075	1	1	<0.001
WEIFANG BEIDA JADE BIRD-A	600076	1	1	<0.001
LIAONING BAIKE GROUP-A	600077	1	1	<0.001
JIANGSU CHENGXING PHOSPH-A	600078	1	1	<0.001
WUHAN HUMANWELL HEALTHCARE-A	600079	1	1	<0.001
GINWA ENTERPRISE GROUP INC-A	600080	1	1	<0.001
DONGFENG ELECTRONIC TECH -A	600081	1	1	<0.001
TIANJIN HI-TECH DEVELOPMEN-A	600082	1	1	<0.001
GUANGDONG BOXIN INVESTING-A	600083	1	1	<0.001
CITIC GUOAN VINE CO LTD-A	600084	1	1	<0.001
BEIJING TONGRENTANG CO-A	600085	1	1	<0.001
EASTERN GOLD JADE CO LTD-A	600086	1	1	<0.001
CSC NANJING TANKER CORPORA-A	600087	1	1	<0.001
CHINA TELEVISION MEDIA LTD-A	600088	1	1	<0.001
TBEA CO LTD-A	600089	1	1	<0.001

SHANGHAI LENGGUANG INDUS-A	600629	1	1	<0.001
SHANGHAI DRAGON CORP-A	600630	1	1	<0.001
ZHE JIANG DAILY MEDIA GRP -A	600633	1	1	<0.001
SHANGHAI DAZHONG PUBLIC UT-A	600635	1	1	<0.001
SHANGHAI 3F NEW MATERIALS-A	600636	1	1	<0.001
BESTV NEW MEDIA CO LTD-A	600637	1	1	<0.001
SHANGHAI NEW HUANGPU REAL-A	600638	1	1	<0.001
SHANGHAI JINQIAO EXPORT P-A	600639	1	1	<0.001
BESTTONE HOLDINGS CO LTD-A	600640	1	1	<0.001
SHANGHAI WANYE ENTERPRISE -A	600641	1	1	<0.001
SHENERGY COMPANY LIMITED-A	600642	1	1	<0.001
SHANGHAI AJ CORPORATION-A	600643	1	1	<0.001
LESHAN ELECTRIC POWER CO-A	600644	1	1	<0.001
ZHONGYUAN UNION STEM CELL -A	600645	1	1	<0.001
SHANGHAI TONGDA VENTURE CA-A	600647	1	1	<0.001
SHANGHAI WAIGAOQIAO FTZ - A	600648	1	1	<0.001
SHANGHAI CHENGTOU HOLDING-A	600649	1	1	<0.001
SHANGHAI JINJIANG INTL-A	600650	1	1	<0.001
FEILO ACOUSTICS CO LTD-A	600651	1	1	<0.001
SHANGHAI ACE CO LTD-A	600652	1	1	<0.001
SHANGHAI SHENHUA HOLDINGS -A	600653	1	1	<0.001
SHANGHAI FEILO CO LTD-A	600654	1	1	<0.001
SHANGHAI YUYUAN TOURIST-A	600655	1	1	<0.001
CINDA REAL ESTATE CO LTD -A	600657	1	1	<0.001
BEIJING ELECTRONIC ZONE-A	600658	1	1	<0.001
FUYAO GROUP GLASS INDUSTR-A	600660	1	1	<0.001
SHANGHAI XIN NANYANG CO LT-A	600661	1	1	<0.001
SHANGHAI QIANGSHENG HLDG-A	600662	1	1	<0.001
SHANGHAI LUJIAZUI FIN&TRAD-A	600663	1	1	<0.001
HARBIN PHARMACEUTICAL GRP-A	600664	1	1	<0.001
TANDE CO LTD-A	600665	1	1	<0.001
SOUTHWEST PHARMACEUTICAL-A	600666	1	1	<0.001
WUXI TAIJI INDUS CO LTD-A	600667	1	1	<0.001
ZHEJIANG JIANFENG GROUP-A	600668	1	1	<0.001
HANGZHOU TIAN-MU-SHAN PHAR-A	600671	1	1	<0.001
GUANGDONG DONGYANGGUANG AL-A	600673	1	1	<0.001
SICHUAN CHUANTOU ENERGY CO-A	600674	1	1	<0.001
CHINA ENTERPRISE CO LTD - A	600675	1	1	<0.001
SHANGHAI JIAO YUN CO LTD-A	600676	1	1	<0.001
AEROSPACE COMMUNICATIONS -A	600677	1	1	<0.001
JINSHAN DEVELOPMENT CONSTR-A	600679	1	1	<0.001
SHANGHAI POTEVIO CO LTD - A	600680	1	1	<0.001
WINOWNER GROUP CO LTD	600681	1	1	<0.001
NANJING XINJIEKOU DEPT-A	600682	1	1	<0.001
METRO LAND CORP LTD -A	600683	1	1	<0.001
GUANGZHOU PEARL RIVER IND-A	600684	1	1	<0.001
GUANGZHOU SHIPYARD INTL CO-A	600685	1	1	<0.001
XIAMEN KING LONG MOTOR CO -A	600686	1	1	<0.001
SINOPEC SHANGHAI PETROCHE-A	600688	1	1	<0.001
SHANGHAI SANMAO ENTERPRISE-A	600689	1	1	<0.001
QINGDAO HAIER CO LTD-A	600690	1	1	<0.001
DONGXIN ELECTRICAL CARBON -A	600691	1	1	<0.001

XINJIANG HOPS CO LTD-A	600090	1	1	<0.001
SICHUAN HEJIA CO-A	600093	1	1	<0.001
HARBIN HIGH-TECH GROUP CO-A	600095	1	1	<0.001
YUNNAN YUNTIANHUA CO-A	600096	1	1	<0.001
SHANGHAI KAICHUANG MARINE-A	600097	1	1	<0.001
GUANGZHOU DEVELOPMENT IND-A	600098	1	1	<0.001
LINHAI COMPANY LTD-A	600099	1	1	<0.001
TSINGHUA TONGFANG CO LTD-A	600100	1	1	<0.001
SICHUAN MINGXING ELEC CO-A	600101	1	1	<0.001
FUJIAN QINGSHAN PAPER INDS-A	600103	1	1	<0.001
SAIC MOTOR CORPORATION LTD-A	600104	1	1	<0.001
JIANGSU YONGDING CO-A	600105	1	1	<0.001
CHONGQING ROAD & BRIDGE CO-A	600106	1	1	<0.001
HUBEI MAILYARD SHARE CO-A	600107	1	1	<0.001
GANSU YASHENG INDUSTRIAL-A	600108	1	1	<0.001
SINOLINK SECURITIES CO LTD-A	600109	1	1	<0.001
CHINA-KINWA HIGH TECH CO-A	600110	1	1	<0.001
INNER MONGOLIA BAOTOU STEE-A	600111	1	1	<0.001
GUIZHOU CHANGZHENG ELEC-A	600112	1	1	<0.001
ZHE JIANG DONG RI-A	600113	1	1	<0.001
NBTM NEW MATERIALS GROUP C-A	600114	1	1	<0.001
CHINA EASTERN AIRLINES CO-A	600115	1	1	<0.001
CHONGQING THREE GORGES-A	600116	1	1	<0.001
XINING SPECIAL STEEL CO-A	600117	1	1	<0.001
CHINA SPACESAT CO LTD -A	600118	1	1	<0.001
YUD YANGTZE RIVER INVEST-A	600119	1	1	<0.001
ZHEJIANG ORIENT HLDGS CO-A	600120	1	1	<0.001
ZHENGZHOU COAL INDUSTRY - A	600121	1	1	<0.001
JIANGSU HONGTU HIGH TECHNO-A	600122	1	1	<0.001
SHANXI LANHUA SCI-TECH-A	600123	1	1	<0.001
CHINA RAILWAY TIELONG CONT-A	600125	1	1	<0.001
HANGZHOU IRON & STEEL CO-A	600126	1	1	<0.001
HUNAN JINJIAN CEREALS INDS-A	600127	1	1	<0.001
JIANGSU HOLLY CORP-A	600128	1	1	<0.001
CHONGQING TAIJI INDUS GRP-A	600129	1	1	<0.001
NINGBO BIRD CO LTD-A	600130	1	1	<0.001
SICHUAN MINJIANG HYDRO-A	600131	1	1	<0.001
CHONGQING BREWERY CO-A	600132	1	1	<0.001
EAST LAKE HIGH TECH GROUP-A	600133	1	1	<0.001
LUCKY FILM CO-A	600135	1	1	<0.001
WUHAN DOUBLE CO-A	600136	1	1	<0.001
SICHUAN LANGSHA HOLDING CO-A	600137	1	1	<0.001
CHINA CYTS TOURS HLDG CO-A	600138	1	1	<0.001
SICHUAN WESTERN RESOURCES-A	600139	1	1	<0.001
HUBEI XINGFA CHEMICALS GRP-A	600141	1	1	<0.001
KINGFA SCI.& TECH CO LTD-A	600143	1	1	<0.001
GUIZHOU GUOCHUANG ENERGY -A	600145	1	1	<0.001
NINGXIA DAYUAN CHEMICAL-A	600146	1	1	<0.001
CHANGCHUN YIDONG CLUTCH CO-A	600148	1	1	<0.001
C&T TECHNOLOGY DEVELOPMENT-A	600149	1	1	<0.001
CHINA CSSC HOLDINGS LTD-A	600150	1	1	<0.001
SHANGHAI AEROSPACE AUTOMOB-A	600151	1	1	<0.001

SHANGHAI YA TONG CO LTD-A	600692	1	1	<0.001
FUJIAN DONGBAI (GROUP) CO -A	600693	1	1	<0.001
DASHANG GROUP CO LTD -A	600694	1	1	<0.001
SHANGHAI DAJIANG GROUP-A	600695	1	1	<0.001
SHANGHAI DUOLUN INDUSTRY - A	600696	1	1	<0.001
CHANGCHUN EURASIA GROUP CO-A	600697	1	1	<0.001
LIAOYUAN JOYSON ELECTRONIC-A	600699	1	1	<0.001
HARBIN GONGDA HI-TECH ENT-A	600701	1	1	<0.001
SICHUAN TUOPAI SHEDE WINE -A	600702	1	1	<0.001
SANAN OPTOELECTRONICS CO L-A	600703	1	1	<0.001
ZHEJIANG MATERIAL INDUSTRI-A	600704	1	1	<0.001
CHANGAN INFORMATION INDUS-A	600706	1	1	<0.001
IRICO DISPLAY DEVICES CO- A	600707	1	1	<0.001
SHANGHAI HAIBO CO LTD-A	600708	1	1	<0.001
CHANGLIN COMPANY LTD-A	600710	1	1	<0.001
CHENGTUN MINING GROUP CO -A	600711	1	1	<0.001
NANNING DEPARTMENT STORE-A	600712	1	1	<0.001
NANJING PHARMACEUTICAL CO-A	600713	1	1	<0.001
QINGHAI JINRUI MINERAL DEV-A	600714	1	1	<0.001
SONGLIAO AUTOMOBILE CO -A	600715	1	1	<0.001
JIANGSU PHOENIX PROPERTY-A	600716	1	1	<0.001
TIANJIN PORT CO LTD-A	600717	1	1	<0.001
NEUSOFT CORP-A	600718	1	1	<0.001
DALIAN THERMAL POWER CO -A	600719	1	1	<0.001
GANSU QILIANSHAN CEMENT GR-A	600720	1	1	<0.001
XIN JIANG BAI HUA CUN CO-A	600721	1	1	<0.001
HEBEI JINNIU CHEMICAL INDU-A	600722	1	1	<0.001
BEIJING CAPITAL RETAILING -A	600723	1	1	<0.001
NINGBO FUDA CO LTD-A	600724	1	1	<0.001
YUNNAN YUNWEI CO LTD-A	600725	1	1	<0.001
HUADIAN ENERGY CO LTD -A	600726	1	1	<0.001
SHANDONG LUBEI CHEMICAL CO-A	600727	1	1	<0.001
SUNTEK TECHNOLOGY CO LTD-A	600728	1	1	<0.001
CHONGQING DEPARTMENT STORE-A	600729	1	1	<0.001
CHINA HI-TECH GROUP CO LTD-A	600730	1	1	<0.001
HUNAN HAILI CHEMICAL INDUS-A	600731	1	1	<0.001
SHANGHAI XINMEI REAL EST-A	600732	1	1	<0.001
CHENGDU QIAN FENG ELEC-A	600733	1	1	<0.001
FUJIAN START GROUP CO LTD-A	600734	1	1	<0.001
SHANDONG HIKING INTERNATIO-A	600735	1	1	<0.001
SUZHOU NEW DISTRICT HI-TEC-A	600736	1	1	<0.001
COFCO TUNHE CO LTD-A	600737	1	1	<0.001
LANZHOU MINBAI SHAREHOLD-A	600738	1	1	<0.001
LIAONING CHENG DA CO LTD-A	600739	1	1	<0.001
SHANXI COKING CO LTD-A	600740	1	1	<0.001
HUAYU AUTOMOTIVE SYSTEMS -A	600741	1	1	<0.001
CHANGCHUN FAWAY AUTOMBILE-A	600742	1	1	<0.001
HUAYUAN PROPERTY CO LTD-A	600743	1	1	<0.001
DATANG HUAYIN ELECTRIC POW-A	600744	1	1	<0.001
JOIN. IN (HOLDING) CO LTD -A	600745	1	1	<0.001
JIANGSU SOPO CHEMICAL CO-A	600746	1	1	<0.001
DALIAN DAXIAN ENTERPRISES-A	600747	1	1	<0.001

NINGBO VEKEN ELITE GROUP-A	600152	1	1	<0.001
XIAMEN C & D INC-A	600153	1	1	<0.001
HEBEI BAOSHUO CO-A	600155	1	1	<0.001
HUNAN HUASHENG-A	600156	1	1	<0.001
WINTIME ENERGY CO LTD-A	600157	1	1	<0.001
CHINA SPORTS IND GROUP CO-A	600158	1	1	<0.001
BEIJING DALONG WEIYE REAL-A	600159	1	1	<0.001
ZHEJIANG JUHUA CO-A	600160	1	1	<0.001
BEIJING TIANTAN BIOLOGICAL-A	600161	1	1	<0.001
SHENZHEN HEUNGKONG HOLDING-A	600162	1	1	<0.001
NINGXIA XINRI HENGLI STEEL-A	600165	1	1	<0.001
BEIQI FOTON MOTOR CO LTD-A	600166	1	1	<0.001
LUENMEI HOLDING CO LTD-A	600167	1	1	<0.001
WUHAN SANZHEN INDUSTRY HO-A	600168	1	1	<0.001
TAIYUAN HEAVY INDUSTRY CO-A	600169	1	1	<0.001
SHANGHAI CONSTRUCTION CO-A	600170	1	1	<0.001
SHANGHAI BELLING CO LTD-A	600171	1	1	<0.001
HENAN HUANGHE WHIRLWIND CO-A	600172	1	1	<0.001
WOLONG REAL ESTATE GROUP C-A	600173	1	1	<0.001
MEIDU HOLDINGS CO LTD-A	600175	1	1	<0.001
CHINA FIBERGLASS CO LTD-A	600176	1	1	<0.001
YOUNGOR GROUP CO-A	600177	1	1	<0.001
HARBIN DONGAN AUTO ENGINE-A	600178	1	1	<0.001
HEILONGJIANG HEIHUA CO-A	600179	1	1	<0.001
SHANDONG JIUFA EDIBLE FUNG-A	600180	1	1	<0.001
GITI TIRE CORP-A	600182	1	1	<0.001
GUANGDONG SHENGYI SCIENCE -A	600183	1	1	<0.001
NORTH ELECTRO-OPTIC CO LTD-A	600184	1	1	<0.001
XI'AN GREE REAL ESTATE CO-A	600185	1	1	<0.001
HENAN LIANHUA GOURMET-A	600186	1	1	<0.001
HEILONGJIANG INTERCHINA WA-A	600187	1	1	<0.001
YANZHOU COAL MINING CO-A	600188	1	1	<0.001
JILIN FOREST INDUSTRY CO-A	600189	1	1	<0.001
JINZHOU PORT CO LTD-A	600190	1	1	<0.001
BAOTOU HUAZI INDUSTRY CO-A	600191	1	1	<0.001
LANZHOU GREAT WALL ELECTRI-A	600192	1	1	<0.001
SHANGHAI PROSOLAR RESOURC-A	600193	1	1	<0.001
CHINA ANIMAL HUSBANDRY-A	600195	1	1	<0.001
SHANGHAI FOSUN PHARMACEUTI-A	600196	1	1	<0.001
XINJIANG YILITE INDUSTRY-A	600197	1	1	<0.001
DATANG TELECOM TECH CO-A	600198	1	1	<0.001
ANHUI GOLDEN SEED WINERY-A	600199	1	1	<0.001
JIANGSU WUZHONG INDUSTRIAL-A	600200	1	1	<0.001
INNER MONGOLIA JINYU GROUP-A	600201	1	1	<0.001
HARBIN AIR CONDITIONING CO-A	600202	1	1	<0.001
FUJIAN FURI ELECTRONICS-A	600203	1	1	<0.001
FUJIAN FURI ELECTRONICS-A	600203	1	1	<0.001
GRINM SEMICONDUCTOR MAT-A	600206	1	1	<0.001
HENAN ANCAI HI-TECH CO-A	600207	1	1	<0.001
XINHU ZHONGBAO CO LTD-A	600208	1	1	<0.001
LAWTON DEVELOPMENT CO LTD-A	600209	1	1	<0.001
SHANGHAI ZI JIANG ENTERPRI-A	600210	1	1	<0.001

SHANGHAI INDUSTRIAL DEVEL-A	600748	1	1	<0.001
TIBET TOURISM CO LTD-A	600749	1	1	<0.001
JIANGZHONG PHARMACEUTICAL-A	600750	1	1	<0.001
TIANJIN MARINE SHIPPING-A	600751	1	1	<0.001
HENAN ORIENTAL SILVER STAR-A	600753	1	1	<0.001
SHANGHAI JINJIANG INTERNAT-A	600754	1	1	<0.001
XIAMEN INTL TRADE GROUP-A	600755	1	1	<0.001
SHANDONG INSPUR SOFTWARE C-A	600756	1	1	<0.001
CHANGJIANG PUBLISHING & ME-A	600757	1	1	<0.001
HAINAN ZHENGHE INDUSTRIAL-A	600759	1	1	<0.001
ZHONGHANG HEIBAO CO LTD -A	600760	1	1	<0.001
ANHUI HELI CO LTD-A	600761	1	1	<0.001
TOPCHOICE MEDICAL INVESTME-A	600763	1	1	<0.001
CEC CORECAST CORP LTD -A	600764	1	1	<0.001
AVIC HEAVY MACHINERY CO LT-A	600765	1	1	<0.001
YANTAI YUANCHENG ENTERPRIS-A	600766	1	1	<0.001
WINSAN SHANGHAI INDUSTRIAL-A	600767	1	1	<0.001
NINGBO FUBANG JINGYE GROUP-A	600768	1	1	<0.001
JIANGSU ZONGYI CO LTD-A	600770	1	1	<0.001
TOPSUN SCIENCE-A	600771	1	1	<0.001
TIBET URBAN DEVELOPMENT -A	600773	1	1	<0.001
WUHAN HANSHANG GROUP CO-A	600774	1	1	<0.001
NANJING PANDA ELEC CO LTD-A	600775	1	1	<0.001
EASTERN COMMUNICATIONS CO-A	600776	1	1	<0.001
YANTAI XINCHAO INDUSTRY CO-A	600777	1	1	<0.001
XINJIANG YOUHAO GROUP CO L-A	600778	1	1	<0.001
SICHUAN SWELLFUN CO LTD-A	600779	1	1	<0.001
SHANGHAI FUREN INDUSTRIAL -A	600781	1	1	<0.001
XINYU IRON & STEEL CO LTD-A	600782	1	1	<0.001
LUXIN VENTURE CAPITAL GRP-A	600783	1	1	<0.001
LUYIN INVESTMENT GROUP CO-A	600784	1	1	<0.001
YINCHUAN XINHUA COMMERCIAL-A	600785	1	1	<0.001
ZHONGCHU DEVELOPMENT STOCK-A	600787	1	1	<0.001
SHANDONG LUKANG PHARMA-A	600789	1	1	<0.001
ZHEJIANG CHINA LIGHT & TEX-A	600790	1	1	<0.001
BEIH-PROPERTY CO LTD-A	600791	1	1	<0.001
YUNNAN COAL ENERGY CO LTD-A	600792	1	1	<0.001
YIBIN PAPER INDUSTRY CO-A	600793	1	1	<0.001
ZHANGJIAGANG FREETRADE SCI-A	600794	1	1	<0.001
GD POWER DEVELOPMENT CO -A	600795	1	1	<0.001
ZHEJIANG QIANJIANG BIOCHEM-A	600796	1	1	<0.001
INSIGMA TECHNOLOGY CO LTD-A	600797	1	1	<0.001
NINGBO MARINE CO LTD-A	600798	1	1	<0.001
TIANJIN GLOBAL MAGNETIC-A	600800	1	1	<0.001
HUAXIN CEMENT CO LTD-A	600801	1	1	<0.001
FUJIAN CEMENT INC-A	600802	1	1	<0.001
HEBEI WEIYUAN BIO-CHEM STK-A	600803	1	1	<0.001
CHENGDU DR PENG TELECOM-A	600804	1	1	<0.001
JIANGSU YUEDA INVESTMENT C-A	600805	1	1	<0.001
SHENJI GROUP KUNMING MACH-A	600806	1	1	<0.001
SHANDONG TYAN HOME CO LTD-A	600807	1	1	<0.001
MAANSHAN IRON & STEEL-A	600808	1	1	<0.001

TIBET RHODIOLA PHARM-A	600211	1	1	<0.001
SHANDONG JIANGQUAN IND-A	600212	1	1	<0.001
YANGZHOU YAXING MOTOR CO-A	600213	1	1	<0.001
CHANGCHUNJINGKAI GROUP CO-A	600215	1	1	<0.001
ZHEJIANG MEDICINE CO LTD-A	600216	1	1	<0.001
SHAANXI QINLING CEMENT CO-A	600217	1	1	<0.001
ANHUI QUANCHAI ENGINE CO-A	600218	1	1	<0.001
SHANDONG NANSHAN ALUMINUM-A	600219	1	1	<0.001
JIANGSU SUNSHINE-A	600220	1	1	<0.001
HAINAN AIRLINES CO-A	600221	1	1	<0.001
HENAN TALOPH PHARMACEUTICA-A	600222	1	1	<0.001
LUSHANG PROPERTY CO LTD -A	600223	1	1	<0.001
TIANJIN SONGJIANG CO LTD -A	600225	1	1	<0.001
ZHEJIANG SHENGHUA BIOK BIO-A	600226	1	1	<0.001
GUIZHOU CHITIANHUA CO LTD-A	600227	1	1	<0.001
JIANGXI CHANGJIU BIOCHEMIC-A	600228	1	1	<0.001
QINGDAO SODA ASH INDUSTR-A	600229	1	1	<0.001
HEBEI CANGZHOU DAHUA CO-A	600230	1	1	<0.001
LINGYUAN IRON & STEEL CO-A	600231	1	1	<0.001
ZHEJIANG GOLDEN EAGLE CO-A	600232	1	1	<0.001
DALIAN DAYANG TRANDS CO LT-A	600233	1	1	<0.001
TAIYUAN TIANLONG GROUP CO-A	600234	1	1	<0.001
MINFENG SPECIAL PAPER CO L-A	600235	1	1	<0.001
GUANGXI GUIGUAN ELECTRIC-A	600236	1	1	<0.001
ANHUI TONGFENG ELECTRONICS-A	600237	1	1	<0.001
HAINAN YEDAO CO LTD-A	600238	1	1	<0.001
YUNNAN METRO REAL ESTATE-A	600239	1	1	<0.001
BEIJING HUAYE REALESTATE-A	600240	1	1	<0.001
LIAONING SHIDAI WANHENG CO-A	600241	1	1	<0.001
ZHONGCHANG MARINE CO LTD-A	600242	1	1	<0.001
QINGHAI HUADING INDUSTRIAL-A	600243	1	1	<0.001
BEIJING VANTONE REAL ESTAT-A	600246	1	1	<0.001
JILIN CHENG CHENG GROUP C-A	600247	1	1	<0.001
SHAANXI YANCHANG PETROLEUM-A	600248	1	1	<0.001
LIUZHOU LIANGMIANZHEN CO L-A	600249	1	1	<0.001
NANJING TEXTILES IMP & EXP-A	600250	1	1	<0.001
XINJIANG GUANNONG FRUIT & -A	600251	1	1	<0.001
GUANGXI WUZHOU ZHONGHENG G-A	600252	1	1	<0.001
HENAN TOPFOND PHARMACEUTIC-A	600253	1	1	<0.001
ANHUI XINKE NEW MATERIAL C-A	600255	1	1	<0.001
GUANGHUI ENERGY CO LTD-A	600256	1	1	<0.001
DAHU AQUACULTURE CO LTD -A	600257	1	1	<0.001
BEIJING CAPITAL TOURISM CO-A	600258	1	1	<0.001
RISING NONFERROUS METAL SH-A	600259	1	1	<0.001
KAILE TECHNOLOGY CO LTD-A	600260	1	1	<0.001
ZHEJIANG YANKON GROUP CO L-A	600261	1	1	<0.001
INNER MONGOLIA NORTH HAULE-A	600262	1	1	<0.001
YUNNAN JINGGU FORESTRY CO-A	600265	1	1	<0.001
BEIJING URBAN CONSTRUCTION-A	600266	1	1	<0.001
ZHEJIANG HISUN PHARMACEUTI-A	600267	1	1	<0.001
GUODIAN NANJING AUTOMATION-A	600268	1	1	<0.001
JIANGXI GANYUE EXPRESSWAY -A	600269	1	1	<0.001

SHANXI XINGHUACUN FEN WINE-A	600809	1	1	<0.001
SHENMA INDUSTRY CO LTD-A	600810	1	1	<0.001
ORIENT GROUP INC.-A	600811	1	1	<0.001
NORTH CHINA PHARM CO-A	600812	1	1	<0.001
HANGZHOU JIEBAI GROUP CO-A	600814	1	1	<0.001
XIAMEN XGMA MACHINERY CO L-A	600815	1	1	<0.001
ANXIN TRUST & INVESTMENT-A	600816	1	1	<0.001
ZHONGLU CO LTD-A	600818	1	1	<0.001
SYP GLASS GROUP CO LTD -A	600819	1	1	<0.001
SHANGHAI TUNNEL ENGINEERIN-A	600820	1	1	<0.001
TIANJIN QUANYE BAZAAR GROU-A	600821	1	1	<0.001
SHANGHAI MATERIAL TRADING-A	600822	1	1	<0.001
SHANGHAI SHIMAO CO LTD-A	600823	1	1	<0.001
SHANGHAI YIMIN COMMERCE -A	600824	1	1	<0.001
SHANGHAI XINHUA MEDIA CO L-A	600825	1	1	<0.001
SHANGHAI LANSHENG CORP-A	600826	1	1	<0.001
SHANGHAI FRIENDSHIP GROUP-A	600827	1	1	<0.001
CHENGSHANG GROUP CO LTD-A	600828	1	1	<0.001
HARBIN PHARMACEUTICAL GROU-A	600829	1	1	<0.001
SUNNY LOAN TOP CO LTD-A	600830	1	1	<0.001
SHAANXI BROADCAST & TV NET-A	600831	1	1	<0.001
SHANGHAI ORIENTAL PEARL-A	600832	1	1	<0.001
SHANGHAI NO.1 PHARMACY CO-A	600833	1	1	<0.001
SHANGHAI SHENTONG METRO CO-A	600834	1	1	<0.001
SHANGHAI MECHANICAL AND EL-A	600835	1	1	<0.001
SHANGHAI JIELONG IND CORP-A	600836	1	1	<0.001
HAITONG SECURITIES CO LTD-A	600837	1	1	<0.001
SHANGHAI JOIN BUY CO LTD-A	600838	1	1	<0.001
SICHUAN CHANGHONG ELECTRIC-A	600839	1	1	<0.001
SHANGHAI DIESEL ENGINE CO-A	600841	1	1	<0.001
SGSB GROUP CO LTD-A	600843	1	1	<0.001
DANHUA CHEMICAL TECHNOLOGY-A	600844	1	1	<0.001
SHANGHAI BAOSIGHT SOFTWARE-A	600845	1	1	<0.001
SHANGHAI TONGJI SCIENCE-A	600846	1	1	<0.001
SHANGHAI AUTOMATION INSTR-A	600848	1	1	<0.001
SHANGHAI EAST-CHINA COMPUT-A	600850	1	1	<0.001
SHANGHAI HAIXIN GROUP CO-A	600851	1	1	<0.001
LONGJIAN ROAD & BRIDGE CO-A	600853	1	1	<0.001
JIANGSU CHUNLAN REFRIG EQ-A	600854	1	1	<0.001
BEIJING AEROSPACE CHANGFEN-A	600855	1	1	<0.001
CHANGCHUN DEPARTMENT JIT-A	600856	1	1	<0.001
HIT SHOUCHUANG TECHNOLOGY-A	600857	1	1	<0.001
SILVER PLAZA GROUP CO LTD-A	600858	1	1	<0.001
BEIJING WANGFUJING DEPT ST-A	600859	1	1	<0.001
BEIJING URBAN & RURAL TRAD-A	600861	1	1	<0.001
TONTEC TECHNOLOGY INVESTME-A	600862	1	1	<0.001
INNER MONGOLIA MENGDIAN HU-A	600863	1	1	<0.001
HARBIN HATOU INVESTMENT CO-A	600864	1	1	<0.001
BAIDA GROUP CO LTD-A	600865	1	1	<0.001
STAR LAKE BIOSCIENCE CO IN-A	600866	1	1	<0.001
TONGHUA DONGBAO PHARMACEUT-A	600867	1	1	<0.001
GUANGDONG MEIYAN HYDROPOWE-A	600868	1	1	<0.001

SINOTRANS AIR TRANSPORT-A	600270	1	1	<0.001
AISINO CO LTD-A	600271	1	1	<0.001
SHANGHAI KAIKAI INDUSTRIAL-A	600272	1	1	<0.001
HUAFANG TEXTILE CO LTD-A	600273	1	1	<0.001
JIANGSU HENGRUI MEDICINE C-A	600276	1	1	<0.001
INNER MONGOLIA YILI ENERGY-A	600277	1	1	<0.001
ORIENT INTERNATIONAL ENTER-A	600278	1	1	<0.001
CHONGQING GANGJIU CO LTD-A	600279	1	1	<0.001
NANJING CENTRAL EMPORIUM-A	600280	1	1	<0.001
TAIYUAN CHEMICAL INDS CO L-A	600281	1	1	<0.001
NANJING IRON & STEEL CO-A	600282	1	1	<0.001
QIANJIANG WATER RESOURCES-A	600283	1	1	<0.001
SHANGHAI PUDONG ROAD&BRIDG-A	600284	1	1	<0.001
HENAN LINGRUI PHARMACEUTIC-A	600285	1	1	<0.001
JIANGSU SAINTY CORP LTD-A	600287	1	1	<0.001
DAHENG NEW EPOCH TECHNOLOG-A	600288	1	1	<0.001
BRIGHT OCEANS INTER-TELECO-A	600289	1	1	<0.001
HUAYI ELECTRIC CO LTD-A	600290	1	1	<0.001
XISHUI STRONG YEAR CO LTD -A	600291	1	1	<0.001
CHONGQING JIULONG ELECTRIC-A	600292	1	1	<0.001
HUBEI SANXIA NEW BUILDING-A	600293	1	1	<0.001
INNER MONGOLIA EERDUOSI RE-A	600295	1	1	<0.001
MERRO PHARMACEUTICAL CO LT-A	600297	1	1	<0.001
ANGEL YEAST CO LTD-A	600298	1	1	<0.001
BLUE STAR NEW CHEMICAL MAT-A	600299	1	1	<0.001
V V FOOD & BEVERAGE CO-A	600300	1	1	<0.001
NANNING CHEMICAL INDUSTRY -A	600301	1	1	<0.001
XI'AN TYPICAL INDUSTRIES-A	600302	1	1	<0.001
LIAONING SG AUTOMOTIVE GRO-A	600303	1	1	<0.001
JIANGSU HENGSHUN VINEGAR I-A	600305	1	1	<0.001
SHENYANG COMMERCIAL CITY -A	600306	1	1	<0.001
GANSU JIU STEEL GROUP HONG-A	600307	1	1	<0.001
SHANDONG HUATAI PAPER CO -A	600308	1	1	<0.001
YANTAI WANHUA POLYURETHANE-A	600309	1	1	<0.001
GUANGXI GUIDONG ELECTRIC-A	600310	1	1	<0.001
GANSU RONGHUA INDUSTRY-A	600311	1	1	<0.001
HENAN PINGGAO ELECTRIC CO-A	600312	1	1	<0.001
ZHONGKEN AGRICULTRAL RES-A	600313	1	1	<0.001
SHANGHAI JAHWA UNITED CO -A	600315	1	1	<0.001
JIANGXI HONGDU AVIATION-A	600316	1	1	<0.001
YINGKOU PORT LIABILITY CO-A	600317	1	1	<0.001
ANHUI CHAODONG CEMENT CO L-A	600318	1	1	<0.001
WEIFANG YAXING CHEMICAL CO-A	600319	1	1	<0.001
SHANGHAI ZHENHUA HEAVY IND-A	600320	1	1	<0.001
SICHUAN GUODONG CONSTRUCTI-A	600321	1	1	<0.001
TIANJIN REALITY DEV GROUP-A	600322	1	1	<0.001
NANHAI DEVELOPMENT CO LTD-A	600323	1	1	<0.001
HUAFA INDUSTRIAL CO LTD ZH-A	600325	1	1	<0.001
TIBET TIANLU CO LTD-A	600326	1	1	<0.001
WUXI COMMERCIAL MANSION CO-A	600327	1	1	<0.001
INNER MONGOLIA LANTAI INDS-A	600328	1	1	<0.001
TIANJIN ZHONG XIN PHARM CO-A	600329	1	1	<0.001

SP PHARMACEUTICAL INDUSTRY-A	600869	1	1	<0.001
XIAMEN OVERSEAS CHINESE EL-A	600870	1	1	<0.001
SINOPEC YIZHENG CHEMICAL -A	600871	1	1	<0.001
JONJEE HIGH-TECH INDUSTRIA-A	600872	1	1	<0.001
MEIHUA HOLDINGS GROUP CO -A	600873	1	1	<0.001
TIANJIN CAPITAL ENVIRON-A	600874	1	1	<0.001
DONGFANG ELECTRIC CORP LTD-A	600875	1	1	<0.001
LUOYANG GLASS COMPANY LTD-A	600876	1	1	<0.001
CHINA JIALING INDUS CO LTD-A	600877	1	1	<0.001
CHINA AEROSPACE TIMES ELEC-A	600879	1	1	<0.001
CHENGDU B-RAY MEDIA CO LTD-A	600880	1	1	<0.001
JILIN YATAI GROUP CO LTD-A	600881	1	1	<0.001
SHANDONG DACHENG PESTICIDE-A	600882	1	1	<0.001
YUNNAN BOWIN TECHNOLOGY IN-A	600883	1	1	<0.001
NINGBO SHANSHAN CO LTD-A	600884	1	1	<0.001
WUHAN LINUO SOLAR ENERGY-A	600885	1	1	<0.001
SDIC POWER HOLDINGS CO LTD-A	600886	1	1	<0.001
INNER MONGOLIA YILI INDUS-A	600887	1	1	<0.001
XINJIANG JOINWORLD CO LTD-A	600888	1	1	<0.001
NANJING CHEMICAL FIBRE-A	600889	1	1	<0.001
CRED HOLDING CO LTD-A	600890	1	1	<0.001
HARBIN CHURIN GROUP JOINTS-A	600891	1	1	<0.001
BAOCHENG INVESTMENT CO LTD	600892	1	1	<0.001
XI'AN AERO-ENGINE PLC -A	600893	1	1	<0.001
GUANGZHOU GUANGRI STOCK CO L	600894	1	1	<0.001
CHINA SHIPPING HAISHENG CO-A	600896	1	1	<0.001
XIAMEN INTERNATIONAL AIR-A	600897	1	1	<0.001
SANLIAN COMMERCIAL CO LTD-A	600898	1	1	<0.001
CHINA YANGTZE POWER CO LTD-A	600900	1	1	<0.001
SHANDONG BINZHOU BOHAI PIS-A	600960	1	1	<0.001
ZHUZHOU SMELTER GROUP CO L-A	600961	1	1	<0.001
SDIC ZHONGLU FRUIT JUICE -A	600962	1	1	<0.001
YUEYANG FOREST & PAPER CO -A	600963	1	1	<0.001
FORTUNE NG FUNG FOOD HEBEI-A	600965	1	1	<0.001
SHANDONG BOHUI PAPER INDU-A	600966	1	1	<0.001
BAOTOU BEIFANG CHUANGYE CO-A	600967	1	1	<0.001
HUNAN CHENDIAN INTL DEV SH-A	600969	1	1	<0.001
SINOMA INTERNATIONAL ENGIN-A	600970	1	1	<0.001
ANHUI HENGYUAN COAL INDUST-A	600971	1	1	<0.001
BAOSHENG SCIENCE AND TECH-A	600973	1	1	<0.001
HUNAN NEW WELLFUL CO LTD-A	600975	1	1	<0.001
WUHAN JIANMIN PHARMACEUTIC-A	600976	1	1	<0.001
GUANGDONG YIHUA TIMBER IND-A	600978	1	1	<0.001
SICHUAN GUANGAN AAA PUBLIC-A	600979	1	1	<0.001
BGRIMM MAGNETIC MATERIALS-A	600980	1	1	<0.001
JIANGSU HIGH HOPE CORP-A	600981	1	1	<0.001
NINGBO THERMAL POWER CO LT-A	600982	1	1	<0.001
HEFEI RONGSHIDA SANYO ELE-A	600983	1	1	<0.001
SHAANXI CONSTRUCTION MACHI-A	600984	1	1	<0.001
ANHUI LEMINGKEHUA CO LTD-A	600985	1	1	<0.001
KEDA GROUP CO LTD -A	600986	1	1	<0.001
ZHEJIANG HANGMIN CO LTD-A	600987	1	1	<0.001

TDG HOLDINGS CO LTD-A	600330	1	1	<0.001
SICHUAN HONGDA CO LTD -A	600331	1	1	<0.001
GUANGZHOU PHARMACEUTICALS-A	600332	1	1	<0.001
CHANGCHUN GAS CO LTD -A	600333	1	1	<0.001
SINOMACH AUTOMOBILE CO LTD-A	600335	1	1	<0.001
AUCMA CO LTD -A	600336	1	1	<0.001
MARKOR INTL FURNITURE CO L-A	600337	1	1	<0.001
XINJIANG DUSHANZI TIANLI-A	600339	1	1	<0.001
CHINA FORTUNE LAND DEVELOP-A	600340	1	1	<0.001
SHAANXI AEROSPACE POWER HI-A	600343	1	1	<0.001
WUHAN YANGTZE COMMUNICATIO-A	600345	1	1	<0.001
DALIAN RUBBER & PLASTICS-A	600346	1	1	<0.001
YANGQUAN COAL INDUSTRY GRP-A	600348	1	1	<0.001
SHANDONG HI-SPEED CO LTD -A	600350	1	1	<0.001
YABAO PHARMACEUTICAL GROUP-A	600351	1	1	<0.001
ZHEJIANG LONGSHENG GROUP C-A	600352	1	1	<0.001
CHENGDU XUGUANG ELECTRONIC-A	600353	1	1	<0.001
GANSU DUNHUANG SEED CO LTD-A	600354	1	1	<0.001
ROUTON ELECTRONIC CO LTD-A	600355	1	1	<0.001
MUDANJIANG HENGFENG PAPER-A	600356	1	1	<0.001
CHINA UNITED TRAVEL CO LTD-A	600358	1	1	<0.001
XINJIANG TALIMU AGRICUL-A	600359	1	1	<0.001
JILIN SINO-MICROELECTRONIC-A	600360	1	1	<0.001
BEIJING HUALIAN HYPERMARKE-A	600361	1	1	<0.001
JIANGXI COPPER CO LTD-A	600362	1	1	<0.001
JIANGXI LIANCHUANG OPTOELE-A	600363	1	1	<0.001
TONGHUA GRAPE WINE CO LTD-A	600365	1	1	<0.001
NINGBO YUNSHENG (GROUP) CO-A	600366	1	1	<0.001
GUIZHOU RED STAR DEVELOPIN-A	600367	1	1	<0.001
GUANGXI WUZHOU COMMUNICATI-A	600368	1	1	<0.001
SOUTHWEST SECURITIES CO LT-A	600369	1	1	<0.001
JIANGSU SANFANGXIANG INDUS-A	600370	1	1	<0.001
WANXIANG DONEED CO LTD-A	600371	1	1	<0.001
CHINA AVIC AVIONICS EQUIP-A	600372	1	1	<0.001
CHINESE UNIVERSE PUBLISHIN-A	600373	1	1	<0.001
HUALING XINGMA AUTOMOBILE -A	600375	1	1	<0.001
BEIJING CAPITAL DEVELOPMEN-A	600376	1	1	<0.001
JIANGSU EXPRESSWAY CO LTD-A	600377	1	1	<0.001
SICHUAN TIANYI SCIENCE & -A	600378	1	1	<0.001
SHAANXI BAOGUANG VACUUM EL-A	600379	1	1	<0.001
JOINCARE PHARMACEUTICAL GR-A	600380	1	1	<0.001
GUANGDONG MINGZHU GROUP CO-A	600382	1	1	<0.001
GEMDALE CORP-A	600383	1	1	<0.001
SHANDONG JINTAI GROUP CO L-A	600385	1	1	<0.001
BEIJING BASHI MEDIA CO LTD-A	600386	1	1	<0.001
ZHEJIANG HAIYUE CO LTD-A	600387	1	1	<0.001
FUJIAN LONGKING CO LTD-A	600388	1	1	<0.001
NANTONG JIANGSHAN AGROCHEM-A	600389	1	1	<0.001
KINGRAY NEW MATERIALS SCI -A	600390	1	1	<0.001
SICHUAN CHENGFA AERO-SCIEN-A	600391	1	1	<0.001
GUANGZHOU DONGHUA ENTERPRI-A	600393	1	1	<0.001
GUIZHOU PANJIANG REFINED-A	600395	1	1	<0.001

GUANGDONG ORIENTAL BROTHER-A	600988	1	1	<0.001
ANHUI SUN-CREATE ELECTRONI-A	600990	1	1	<0.001
GUIZHOU WIRE ROPE CO LTD-A	600992	1	1	<0.001
MAYINGLONG PHARMACEUTICAL-A	600993	1	1	<0.001
YUNNAN WENSHAN ELECTRIC PO-A	600995	1	1	<0.001
KAILUAN ENERGY CHEMICAL CO-A	600997	1	1	<0.001
JOINTOWN PHARMACEUTICAL-A	600998	1	1	<0.001
CHINA MERCHANTS SECURITIES-A	600999	1	1	<0.001
TANGSHAN PORT GROUP CO LTD-A	601000	1	1	0.0032
DATONG COAL INDUSTRY CO -A	601001	1	1	<0.001
GEM-YEAR INDUSTRIAL CO -A	601002	1	1	<0.001
LIUZHOU IRON & STEEL CO -A	601003	1	1	<0.001
CHONGQING IRON & STEEL CO-A	601005	1	1	<0.001
DAQIN RAILWAY CO LTD -A	601006	1	1	<0.001
JINLING HOTEL CORP LTD-A	601007	1	1	<0.001
JIANGSU LIANYUNGANG PORT -A	601008	1	1	<0.001
BANK OF NANJING CO LTD -A	601009	1	1	<0.001
WENFENG GREAT WORLD CHAIN-A	601010	1	0	0.0927
QITAIHE BAOTAILONG COAL-A	601011	1	1	<0.001
NINGBO PORT CO LTD-A	601018	1	1	<0.001
JIANGSU YULONG STEEL PIPE -A	601028	1	1	0.0014
SAILUN CO LTD -A	601058	1	1	<0.001
CHINA SHENHUA ENERGY CO-A	601088	1	1	<0.001
CHINA SOUTH PUBLISHING -A	601098	1	1	<0.001
PACIFIC SECURITIES CO/THE-A	601099	1	1	<0.001
JIANGSU HENGLI HIGHPRESSUR-A	601100	1	0	0.1707
BEIJING HAOHUA ENERGY RESO-A	601101	1	1	<0.001
CHINA FIRST HEAVY INDUSTR-A	601106	1	1	<0.001
SICHUAN EXPRESSWAY CO-A	601107	1	1	<0.001
AIR CHINA LTD-A	601111	1	1	<0.001
YIWU HUADING NYLON CO LTD-A	601113	1	0	0.0620
SANJIANG SHOPPING CLUB CO-A	601116	1	1	<0.001
CHINA NATIONAL CHEMICAL-A	601117	1	1	<0.001
CHINA HAINAN RUBBER INDUST-A	601118	1	1	<0.001
BEIJING SIFANG AUTOMATION-A	601126	1	1	0.0196
NINGBO POWERWAY ALLOY MATE-A	601137	1	1	0.0208
SHENZHEN GAS CORP LTD-A	601139	1	1	<0.001
CHONGQING WATER GROUP-A	601158	1	1	<0.001
INDUSTRIAL BANK CO LTD -A	601166	1	1	<0.001
WESTERN MINING CO -A	601168	1	1	<0.001
BANK OF BEIJING CO LTD -A	601169	1	1	<0.001
HANGZHOU ADVANCE GEARBOX-A	601177	1	1	<0.001
CHINA XD ELECTRIC CO LTD-A	601179	1	1	<0.001
CHINA RAILWAY CONSTRUCTION-A	601186	1	1	<0.001
HEILONGJIANG TRANSPORTATIO-A	601188	1	1	<0.001
JIANGSU JIANGNAN WATER CO-A	601199	1	1	0.0039
SICHUAN EM TECHNOLOGY CO-A	601208	1	1	0.0087
INNER MONGOLIA JUNZHENG EN-A	601216	1	1	0.0289
JIANGSU JIXIN WIND ENERGY-A	601218	1	0	0.0572
TONGKUN GROUP CO LTD-A	601233	1	0	0.5000
PANG DA AUTOMOBILE TRADE -A	601258	1	1	0.0010
CHINA ERZHONG GROUP DEYANG-A	601268	1	1	0.0196

SHENYANG JINSHAN ENERGY CO-A	600396	1	1	<0.001
ANYUAN COAL INDUSTRY GRP-A	600397	1	1	<0.001
CANAL SCIENTIFIC & TECH CO-A	600398	1	1	<0.001
FUSHUN SPECIAL STEEL CO-A	600399	1	1	<0.001
JIANGSU HONGDOU INDUSTRY C-A	600400	1	1	<0.001
HAREON SOLAR TECHNOLOGY CO-A	600401	1	1	<0.001
HENAN DAYOU ENERGY CO LTD-A	600403	1	1	<0.001
BEIJING DYNAMIC POWER CO L-A	600405	1	1	<0.001
NARI TECHNOLOGY DEVELOPMEN-A	600406	1	1	<0.001
SHANXI ANTAI GROUP CO LTD -A	600408	1	1	<0.001
TANGSHAN SANYOU CHEMICAL I-A	600409	1	1	<0.001
BEIJING TEAMSUN TECHNOLOGY-A	600410	1	1	<0.001
ZHEJIANG CHINA COMMODITIES-A	600415	1	1	<0.001
XIANGTAN ELECTRIC MANUFACT-A	600416	1	1	<0.001
ANHUI JIANGHUAI AUTO CO-A	600418	1	1	<0.001
SHANGHAI MODERN PHARMACEUT-A	600420	1	1	<0.001
WUHAN GUOYAO TECHNOLOGY CO-A	600421	1	1	<0.001
KUNMING PHARMACEUTICAL COR-A	600422	1	1	<0.001
LIUZHOU CHEMICAL INDUSTRY-A	600423	1	1	<0.001
XINGJIANG QINGSONG BUILDIN-A	600425	1	1	<0.001
SHANDONG HUALU HENGSHENG-A	600426	1	1	<0.001
COSCO SHIPPING CO LTD-A	600428	1	1	<0.001
BEIJING SANYUAN FOODS CO-A	600429	1	1	<0.001
JINLIN JI EN NICKEL INDUST-A	600432	1	1	<0.001
GUANGDONG GUANHAO HIGH-TEC-A	600433	1	1	<0.001
NORTH NAVIGATION CONTROL T-A	600435	1	1	<0.001
ZHANGZHOU PIENTZEHUANG PHA-A	600436	1	1	<0.001
TONGWEI CO LTD-A	600438	1	1	<0.001
HENAN REBECCA HAIR PRODUCT-A	600439	1	1	<0.001
SHENZHEN KINGDOM SCI-TECH-A	600446	1	1	<0.001
HUAFANG LTD CO - A	600448	1	1	<0.001
NINGXIA BUILDING MATERIALS-A	600449	1	1	<0.001
CHONGQING FULING ELECTRIC-A	600452	1	1	<0.001
BAOJI TITANIUM INDUSTRY CO-A	600456	1	1	<0.001
ZHUZHOU TIMES NEW MATERIAL-A	600458	1	1	<0.001
SINO-PLATINUM METALS CO-A	600459	1	1	<0.001
HANGZHOU SILAN MICROELECTR-A	600460	1	1	<0.001
JIANGXI HONGCHENG WATERWOR-A	600461	1	1	<0.001
BEIJING AIRPORT HIGH-TECH-A	600463	1	1	<0.001
SICHUAN DIKANG SCI & TECH-A	600466	1	1	<0.001
SHANDONG HOMEY AQUATIC DEV-A	600467	1	1	<0.001
TIANJIN BENEFO TEJING ELEC-A	600468	1	1	<0.001
AEOLUS TYRE CO LTD-A	600469	1	1	<0.001
ANHUI LIUGUO CHEMICAL CO L-A	600470	1	1	<0.001
WUXI HUAGUANG BOILER CO-A	600475	1	1	<0.001
HUNAN COPOTE SCIENCE & TEC-A	600476	1	1	<0.001
ZHEJIANG HANGXIAO STEEL-A	600477	1	1	<0.001
HUNAN CORUN NEW ENERGY CO-A	600478	1	1	<0.001
ZHUZHOU QIANJIN PHARMACEUT-A	600479	1	1	<0.001
LINGYUN INDUSTRIAL CORP-A	600480	1	1	<0.001
SHUANGLIANG ECO-ENERGY SYS-A	600481	1	1	<0.001
FUJIAN NANFANG TEXTILE CO -A	600483	1	1	<0.001

AGRICULTURAL BANK OF CHINA-A	601288	1	1	<0.001
CHINA CNR CORP LTD-A	601299	1	1	<0.001
CAMEL GROUP CO LTD-A	601311	1	1	0.0225
PING AN INSURANCE GROUP CO-A	601318	1	1	<0.001
BANK OF COMMUNICATIONS CO-A	601328	1	1	<0.001
GUANGSHEN RAILWAY CO LTD-A	601333	1	1	<0.001
NEW CHINA LIFE INSURANCE C-A	601336	1	1	0.0114
XI'AN SHAANGU POWER CO LTD-A	601369	1	1	<0.001
INDUSTRIAL SECURITIES CO-A	601377	1	1	<0.001
CHINA RAILWAY GROUP LTD-A	601390	1	1	<0.001
IND & COMM BK OF CHINA-A	601398	1	1	<0.001
JILIN EXPRESSWAY CO LTD-A	601518	1	1	<0.001
SHANGHAI GREAT WISDOM CO-A	601519	1	1	<0.001
SOOCHOW SECURITIES CO LTD-A	601555	1	0	0.0087
JOEONE CO LTD -A	601566	1	1	0.0268
NINGBO SANXING ELECTRIC CO-A	601567	1	0	0.5000
BEIJING NORTH STAR CO LTD-A	601588	1	1	<0.001
JIANGSU LUGANG SCIENCE AN-A	601599	1	1	<0.001
ALUMINUM CORP OF CHINA LTD-A	601600	1	1	<0.001
CHINA PACIFIC INSURANCE GR-A	601601	1	1	<0.001
SHANGHAI PHARMACEUTICALS-A	601607	1	1	<0.001
SHANGHAI GUANGDIAN ELECTRI-A	601616	1	1	0.0238
METALLURGICAL CORP OF CHIN-A	601618	1	1	<0.001
CHINA LIFE INSURANCE CO-A	601628	1	1	<0.001
GREAT WALL MOTOR CO LTD-A	601633	1	1	0.0145
ZHUZHOU KIBING GROUP CO LT-A	601636	1	0	0.0855
PINGDINGSHAN TIANAN COAL -A	601666	1	1	<0.001
CHINA STATE CONSTRUCTION -A	601668	1	1	<0.001
SINOHYDRO GROUP LTD-A	601669	1	1	<0.001
HENAN MINGTAI AL INDUSTRIA-A	601677	1	0	0.5000
BEFAR GROUP CO LTD-A	601678	1	1	0.0076
HUATAI SECURITIES CO LTD-A	601688	1	1	<0.001
SHANXI LU'AN ENVIRONMENTAL-A	601699	1	1	<0.001
CHANGSHU FENGFAN POWER EQU-A	601700	1	1	<0.001
ZHENGZHOU COAL MINING MACH-A	601717	1	1	<0.001
JIHUA GROUP CORP LTD-A	601718	1	1	<0.001
SHANGHAI ELECTRIC GRP CO L-A	601727	1	1	<0.001
CSR CORP LTD -A	601766	1	1	<0.001
LIFAN INDUSTRY GROUP CO LT-A	601777	1	1	<0.001
EVERBRIGHT SECURITIE CO -A	601788	1	1	<0.001
NINGBO CONSTRUCTION CO LTD-A	601789	1	1	<0.001
LANPEC TECHNOLOGIES CO LTD-A	601798	1	1	0.0027
CHANGZHOU XINGYU AUTOMOTIV-A	601799	1	1	0.0361
ANHUI XINHUA MEDIA CO LTD-A	601801	1	1	<0.001
CHINA OILFIELD SERVICES-A	601808	1	1	<0.001
CHINA EVERBRIGHT BANK CO-A	601818	1	1	<0.001
PETROCHINA CO LTD-A	601857	1	1	<0.001
CHINA SHIPPING CONTAINER-A	601866	1	1	<0.001
CHINA MERCHANTS ENERGY -A	601872	1	1	<0.001
ZHEJIANG CHINT ELECTRICS-A	601877	1	1	<0.001
DALIAN PORT PDA CO LTD-A	601880	1	1	<0.001
BEIJING JANGHO CURTAIN WAL-A	601886	1	1	0.0165

BEIJING ZHONGCHUANG TELE-A	600485	1	1	<0.001
JIANGSU YANGNONG CHEMICAL -A	600486	1	1	<0.001
HENGTONG OPTIC-ELECTRIC CO-A	600487	1	1	<0.001
TIANJIN TIANYAO PHARM-A	600488	1	1	<0.001
ZHONGJIN GOLD CORP-A	600489	1	1	<0.001
SHANGHAI SYNICA CO LTD-A	600490	1	1	<0.001
LONG YUAN CONSTRUCTION GRO-A	600491	1	1	<0.001
CHANGJIANG & JINGGONG BUIL-A	600496	1	1	<0.001
YUNNAN CHIHONG ZINC & GERM-A	600497	1	1	<0.001
FIBERHOME TELECOM TECH CO-A	600498	1	1	<0.001
KEDA INDUSTRIAL CO LTD -A	600499	1	1	<0.001
SINOCHEM INTL CORP-A	600500	1	1	<0.001
AEROSUN CORP-A	600501	1	1	<0.001
ANHUI WATER RESOURCES DEVE-A	600502	1	1	<0.001
DELUXE FAMILY CO LTD-A	600503	1	1	<0.001
SICHUAN XICHANG ELECTRIC P-A	600505	1	1	<0.001
XINJIANG KORLA PEAR CO LTD-A	600506	1	1	<0.001
FANGDA SPECIAL STEEL TECH-A	600507	1	1	<0.001
SHANGHAI DATUN ENERGY-A	600508	1	1	<0.001
XINJIANG TIANFU THERMOELE-A	600509	1	1	<0.001
BLACK PEONY CO LTD-A	600510	1	1	<0.001
CHINA NATIONAL MEDICINES-A	600511	1	1	<0.001
TENGDA CONSTRUCTION GROUP-A	600512	1	1	<0.001
JIANGSU LIANHUAN PHARMACEU-A	600513	1	1	<0.001
HAINAN ISLAND CONSTRUCTION-A	600515	1	1	<0.001
FANGDA CARBON NEW MATERIAL-A	600516	1	1	<0.001
SHANGHAI ZHIXIN ELECTRIC C-A	600517	1	1	<0.001
KANGMEI PHARMACEUTICAL CO-A	600518	1	1	<0.001
KWEICHOW MOUTAI CO LTD-A	600519	1	1	<0.001
TONGLING ZHONGFA SUNTECH -A	600520	1	1	<0.001
ZHEJIANG HUAHAI PHARMACEUT-A	600521	1	1	<0.001
JIANGSU ZHONGTIAN TECHNOLO-A	600522	1	1	<0.001
GUIZHOU GUIHANG AUTOMOTIVE-A	600523	1	1	<0.001
CHANGYUAN GROUP LTD - A	600525	1	1	<0.001
ZHEJIANG FEIDA ENVIRONMENT-A	600526	1	1	<0.001
JIANGSU JIANGNAN HIGH POLY-A	600527	1	1	<0.001
CHINA RAILWAY ERJU CO LTD-A	600528	1	1	<0.001
SHANDONG PHARMACEUTICAL - A	600529	1	1	<0.001
SHANGHAI JIAODA ONLLY CO L-A	600530	1	1	<0.001
HENAN YUGUANG GOLD&LEAD CO-A	600531	1	1	<0.001
SHANDONG HUAYANG TECHNOLOG-A	600532	1	1	<0.001
NANJING CHIXIA DEVELOPMENT-A	600533	1	1	<0.001
TASLY PHARMACEUTICAL GROUP-A	600535	1	1	<0.001
CHINA NATIONAL SOFTWARE -A	600536	1	1	<0.001
EGING PHOTOVOLTAIC TECHNO-A	600537	1	1	<0.001
BEIHAI GOFAR MARINE BIOLOG-A	600538	1	1	<0.001
XINJIANG SAILIMU MODERN -A	600540	1	1	<0.001
GANSU MOGAO INDUSTRIAL DEV-A	600543	1	1	<0.001
XINJIANG URBAN CONSTRUCTIO-A	600545	1	1	<0.001
SHANXI COAL INTERNATIONAL -A	600546	1	1	<0.001
SHANDONG GOLD MINING CO LT-A	600547	1	1	<0.001
SHENZHEN EXPRESSWAY CO LTD-A	600548	1	1	<0.001

CHINA INTERNATIONAL TRAVEL-A	601888	1	1	<0.001
ASIAN STAR ANCHOR CHAIN-A	601890	1	1	<0.001
CHINA COAL ENERGY CO-A	601898	1	1	<0.001
ZIJIN MINING GROUP CO LTD-A	601899	1	1	<0.001
FOUNDER SECURITIES CO LTD-A	601901	1	1	<0.001
BEIJING JINGYUNTONG TECHNO-A	601908	1	0	0.2685
SDIC XINJI ENERGY CO -A	601918	1	1	<0.001
CHINA COSCO HOLDINGS-A	601919	1	1	<0.001
JIANGSU PHOENIX PUBLISH-A	601928	1	1	<0.001
YONGHUI SUPERSTORES CO LTD-A	601933	1	1	<0.001
CHINA CONSTRUCTION BANK-A	601939	1	1	<0.001
JINDUICHENG MOLYBDENUM CO -A	601958	1	1	<0.001
BANK OF CHINA LTD-A	601988	1	1	<0.001
CHINA SHIPBUILDING INDUSTR-A	601989	1	1	<0.001
DATANG INTL POWER GEN CO-A	601991	1	1	<0.001
BBMG CORPORATION-A	601992	1	0	0.1605
GUANGXI FENGLIN WOOD INDUS-A	601996	1	0	0.5000
CHINA CITIC BANK CORP LTD-A	601998	1	1	<0.001
NORTHERN UNITED PUBLISHING-A	601999	1	1	<0.001
INESA ELECTRON CO LTD-B	900901	1	1	<0.001
SHANGHAI ERFANGJI CO LTD-B	900902	1	1	<0.001
DAZHONG TRANSPORTATION GRP-B	900903	1	1	<0.001
SHANGHAI WINGSUNG INVEST-B	900904	1	1	<0.001
LAO FENG XIANG CO LTD-B	900905	1	1	<0.001
CHINA TEXTILE MACHINERY-B	900906	1	1	<0.001
SHANGHAI DINGLI TECHNOLOGY-B	900907	1	1	<0.001
SHANGHAI CHLOR-ALKALI CHEM-B	900908	1	1	<0.001
DOUBLE COIN HOLDINGS LTD-B	900909	1	1	<0.001
SHANGHAI HIGHLY GROUP CO-B	900910	1	1	<0.001
SHANGHAI JINQIAO EXPORT PR-B	900911	1	1	<0.001
SHANGHAI WAIGAOQIAO FREE- B	900912	1	1	<0.001
SHANGHAI LIANHUA FIBRE-B	900913	1	1	<0.001
SHANGHAI JINJIANG INTL-B	900914	1	1	<0.001
ZHONGLU CO LTD-B	900915	1	1	<0.001
JINSHAN DEVELOPMENT CONSTR-B	900916	1	1	<0.001
SHANGHAI HAIXIN GROUP CO-B	900917	1	1	<0.001
SYP GLASS GROUP CO LTD -B	900918	1	1	<0.001
SHANGHAI DAJIANG GROUP-B	900919	1	1	<0.001
SHANGHAI DIESEL ENGINE CO-B	900920	1	1	<0.001
DANHUA CHEMICAL TECHNOLOGY-B	900921	1	1	<0.001
SHANGHAI SANMAO ENTERPRISE-B	900922	1	1	<0.001
SHANGHAI FRIENDSHIP GROUP-B	900923	1	1	<0.001
SGSB GROUP CO LTD-B	900924	1	1	<0.001
SHANGHAI MECHANICAL AND EL-B	900925	1	1	<0.001
SHANGHAI BAOSIGHT SOFTWARE-B	900926	1	1	<0.001
SHANGHAI MATERIAL TRADING-B	900927	1	1	<0.001
SHANGHAI AUTOMATION INSTR-B	900928	1	1	<0.001
SH JINJIANG INTL TRAVEL -B	900929	1	1	<0.001
SHANGHAI POTEVIO CO LTD-B	900930	1	1	<0.001
SHANGHAI LUJIAZUI FIN&TRAD-B	900932	1	1	<0.001
HUAXIN CEMENT CO LTD-B	900933	1	0	-
SH JINJIANG INTL HOTELS - B	900934	1	1	<0.001

XIAMEN TUNGSTEN CO LTD-A	600549	1	1	<0.001
BAODING TIANWEI BAOBIAN-A	600550	1	1	<0.001
TIME PUBLISHING AND MEDIA-A	600551	1	1	<0.001
ANHUI FANGXING SCIENCE-A	600552	1	1	<0.001
SHANGHAI NINE DRAGON CO LT-A	600555	1	1	<0.001
JIANGSU KANION PHARMACEUTI-A	600557	1	1	<0.001
ATLANTIC CHINA WELDING CON-A	600558	1	1	<0.001
HEBEI HENGSHUI LAOBAIGAN-A	600559	1	1	<0.001
BEIJING ARITIME INTELLIGEN-A	600560	1	1	<0.001
JIANGXI CHANGYUN CO LTD-A	600561	1	1	<0.001
JIANGSU GAOCHUN CERAMICS C-A	600562	1	1	<0.001
XIAMEN FARATRONIC CO LTD-A	600563	1	1	<0.001
HUBEI HONGCHENG GENERAL-A	600566	1	1	<0.001
ANHUI SHANYING PAPER IND-A	600567	1	1	<0.001
ZHONGZHU HOLDING CO LTD-A	600568	1	1	<0.001
ANYANG IRON & STEEL CO LTD-A	600569	1	1	<0.001
HUNDSUN ELECTRONIC CO LTD-A	600570	1	1	<0.001
HANGZHOU SUNYARD SYSTEM -A	600571	1	1	<0.001
ZHEJIANG CONBA PHARMACEUTI-A	600572	1	1	<0.001
FUJIAN YANJINGHUIQUAN BREW-A	600573	1	1	<0.001
WUHU PORT STORAGE&TRANSPOR-A	600575	1	1	<0.001

SHANGHAI YOUNGSUN INVEST-B	900935	1	1	<0.001
INNER MONGOLIA EERDUOSI RE-B	900936	1	1	<0.001
HUADIAN ENERGY CO LTD -B	900937	1	1	<0.001
TIANJIN MARINE SHIPPING CO-B	900938	1	1	<0.001
SHANGHAI HUILI BUILDING-B	900939	1	1	<0.001
GREATTOWN HOLDINGS LTD-B	900940	1	1	<0.001
EASTERN COMMUNICATIONS CO-B	900941	1	1	<0.001
HUANGSHAN TOURISM DEVELOP-B	900942	1	1	<0.001
SHANGHAI KAIKAI INDUS CO-B	900943	1	1	<0.001
HAINAN AIRLINES CO-B	900945	1	1	<0.001
SHANGHAI ZHENHUA HEAVY IND-B	900947	1	1	<0.001
INNER MONGOLIA YITAI COAL-B	900948	1	1	<0.001
ZHEJIANG SOUTHEAST ELEC-B	900949	1	1	<0.001
JIANGSU FUTURE LAND CO LTD-B	900950	1	1	<0.001
DAHUA GROUP DALIAN CHEM-B	900951	1	1	<0.001
JINZHOU PORT CO LTD-B	900952	1	1	<0.001
KAMA CO LTD-B	900953	1	1	<0.001
SHANGHAI NINE DRAGON CO LT-B	900955	1	1	<0.001
HUANGSHI DONGBEI ELEC-B	900956	1	1	<0.001
SHANGHAI LINGYUN INDUSTRIE-B	900957	1	1	<0.001

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Modeling of Dual Listed Chinese Stocks – Weak Arbitrage Environment
Abstract

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Abstract

The importance of the Chinese capital markets has increased dramatically over the last few years with the development of the Chinese economy. China is now the second largest economy in the world and some analyst forecast that it could overcome relatively soon the US. The Chinese capital market has some very interesting peculiarities. For instance, China has in reality two largely independent capital markets, one in Hong Kong and another one in mainland China. Hong Kong came back to Chinese sovereignty in 1997 and has kept most of its financial structure unchanged since then with an independent stock exchange (Hong Kong Stock Exchange) as well as a de-facto central bank (Hong Kong Monetary Authority).

Interestingly there are some companies that are listed both in the mainland China market (in the Shanghai or Shenzhen Stock Exchange) and in the Hong Kong market (Hong Kong Stock Exchange). For instance, Bank of China is listed in both, the mainland and in Hong Kong markets. It should also be noted that these markets are rather different. Hong Kong is an open market where international and domestic investors have very limited restrictions on buying/selling stocks. This market is dominated by international institutional investors. The mainland market remains a closed one. International investors cannot access this market. There are a small amount of pilot programs that allow foreign institutional investors to access this market, such as the QFII (Qualified Foreign Institutional Investor) and RQFII (RMB Qualified Foreign Institutional Investors), but these pilots remain rather small compared to the size of the overall market (less than 2%). Similarly, mainland China domestic investors cannot purchase overseas stocks, including Hong Kong listed stocks. There is a pilot program called QDII (Qualified Domestic Institutional Investor) that allows domestic investors to purchase overseas but, as in the previous case, this program is very small with just a hand full of QFII products successfully launched. The mainland market is dominated by retail institutional investors.

Mainland stocks (typically called A-share) and Hong Kong stocks of Chinese companies (typically called H-share) even if they represent the same underlying company do not always trade in the same direction. There are several other "Chinese stocks" such as B-shares or L-shares (Chinese companies listed in London). This dissertation focuses on A-H dual listed stocks. B-shares were designed to allow foreign investors access to the mainland market and for a long period of time domestic investors were not allowed to trade such securities. The B-share market is disappearing with no new IPO in more than a decade and a very limited amount of stocks. It was expected by market participants for a long time that the B-share market will merge with the H-share market and in fact this process has recently started.

It has been argued by many analysts that Hong Kong has a better corporate governance as well as investors' protection law than mainland China. A review of legal reports covering this issue does seem to indicate that Hong Kong does have a better (or at least more western like) investors protection system. Owning the A-share of a dual listed company is not strictly the same than owning the H-share of the same company (dual listed) at least from a legal point of view. The literature review seems to indicate that this apparent gap between the mainland and Hong Kong has considerably narrowed over the last few years.

Dual listed A-H companies can be broadly divided into two types of companies, the large state-owned banks (and related companies) and the rest of corporations with dramatically different behaviors on their price spread (A-H spread). A Markov-switching model was utilized to quantify this behavior. This model shows that the large state-owned banks have one period with infinite duration, meaning that it would be very difficult for an investor to find an arbitrage opportunity in this type of company.

Given that the A-share and H-share of a dual listed company move in the same daily direction on average only in 65% of the cases finding trading opportunities could be difficult and would likely require considerable market knowledge. GARCH(P,Q) models were used to model the volatility of the stocks (A-share, H-share as well as the spreads) taking into consideration clustering effects (an ARCH test showed the existence of ARCH effects). The results shows that a that a GARCH(1,1) is not an inferior model to a GARCH(2,1) for most dual listed companies It was also shown trough a case study (airlines) that it is not possible to conclude in general that comparable companies, such as China Southern Airlines and China Eastern Airlines, are necessarily best described by the same model (GARCH(1,1) or GARCH(2,1)).

It is important to understand that there are some technical factors, such as different opening hours or different bank holidays that can impact prices in one exchange but not the other. There are also other more exotic events such as typhoons that can, and do, halt trading in one exchange and not the other. Typhoons hit Hong Kong with relatively frequency. For example, trading was halted due to typhoons in Hong Kong over the last couple of years several times. Hong Kong has a very well structured system of weather alarms and compulsory market closures in place. Clearly this type of event could make Hong Kong investors unable to react to a market development in the mainland (obviously impacting stock spreads). Another thing to consider is limitations on short selling. Short selling is allowed for most Hong Kong listed companies but foreign investors accessing the A-share market through the QFII or RQFII program are not allowed to short A-shares. This makes an arbitrage strategy extremely difficult in real terms. Very recently (early 2013) the Chinese authorities introduced an initiative allowing foreign investors to use index futures (on the CSI 300 index) through the QFII program. QFII investors are now able to short the CSI 300 and hence hedge their positions. Two things should be noted: 1) shorting at a company level remains forbidden for QFIIs and 2) shorting the CSI 300 index is only allowed for hedging purposes (the current regulation does not allow for arbitrage

strategies).

Trading costs are also different between the Hong Kong and mainland exchanges. Another factor to take into account is the strong limitations on daily movements in the mainland markets. Share price cannot go up or down more than 10% for the closure price in the previous day. When the share price increases by 10% or decreases by 10% then trading in the company is halted (this is commonly called in the industry a “limit up” event).

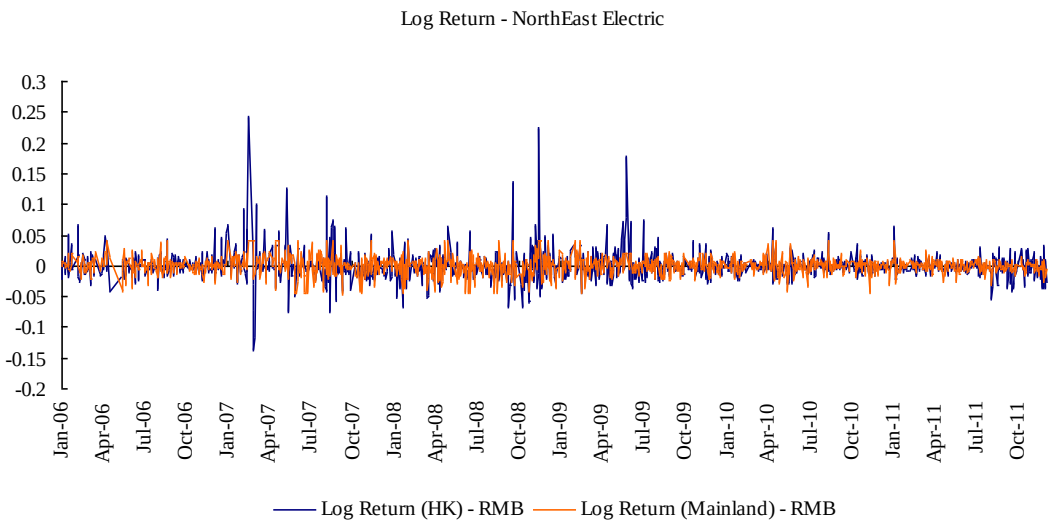
This article identifies 21 main topics that can potentially affect the difference in price of dual listed companies:

1. Difference legal system (claim on assets)
2. Difference investor base (retail vs institutional)
3. Liquidity
4. Regulation
5. Trading cost
6. Trading hours
7. Bank holidays
8. Trading up/down limits
9. Short selling
10. Foreign exchange effect
11. Central bank intervention
12. Language (Mandarin vs Cantonese)
13. Access/speed of information
14. Different dividends
15. Inflation expectations
16. Different investor overall economic outlook
17. Level of financial education of investors (retail)
18. Predominant trading styles
19. Investment horizons

20. Closing price calculation

21. Settlement

Another important point in this dissertation is that the volatility in the A-share market is not necessarily higher than in the H-share market, at least for the period analyzed. It is commonly assumed that the volatility in the mainland market is higher as there are more retail investors (more heard behavior). The results clearly indicate that the volatility for the 12 months period analyzed was not higher in the A-share market than in the H-share. It should be noted that the results do not contradict the idea that there is significant heard behavior in the mainland market China it just indicates that it cannot we concluded that given any relatively long period of time (for instance one year) it can be assumed that the H-share market will have less volatility than its A-share counterparty. Multidimensional scaling techniques were used as a preprocessing tool. The main objective of this MDS analysis was to have a clearer picture about the clustering of the data as well as to be able to visualize (in a more comprehensible way) the large amount of data. Besides a few exceptions the bulk of the companies tend to strongly clustered.



Data source: Bloomberg

Some of the main results in the first half of the dissertation include:

1) Returns of Chinese stocks are not normally distributed. This analysis holds not only for dual listed companies but for all Chinese companies (all listed Chinese companies were analyzed).

2) There is no strong linear correlation among the A-share and H-share of Chinese dual listed companies. This clearly does not imply that there is not some kind of relationship between H-share and A-share returns of dual listed companies. It only means that this relationship is not linear.

3) There is no statistically significant difference between investing in the A-share or the H-share of a dual listed Chinese companies if hold for a relatively long period (12 months).

4) While the A-share market tends to be more volatile than the H-share market for dual listed companies the assumption does not hold true for any given long period of time (12 months).

5) The introduction of the QFII program did not have any statistically significant impact in the behaviour of dual listed companies.

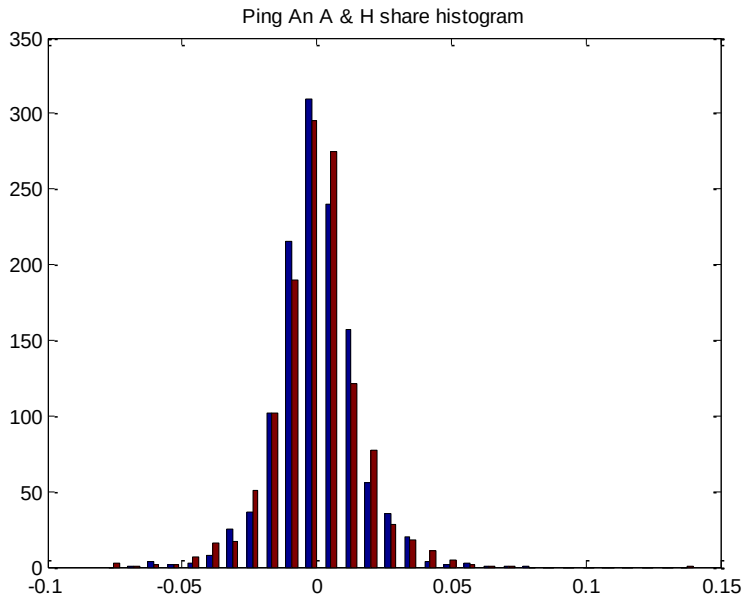
6) The A-share market does not always react on a more volatile way to "market events" such as profit warnings than the H-share market (dual listed companies).

7) The analysis seems to differentiate between two types of dual listed Chinese companies. Basically representing the large state-owned Chinese banks and related companies in one sector and all the other companies in another sector.

8) A factor model analysis of dual listed companies including some of the major economic indicators such as CPI, CPI (food only), SHIBOR, M2, gross output value of industry, consumer confidence, effective policy rate, export price, import price and PMI, with four components seems to work nicely for dual listed Chinese stocks with components that seem to have interpretable meanings.

9) Efficient frontiers were calculated for both the A-share (portfolio) and the H-share portfolio. The efficient frontiers look rather different in the case of the A-share and H-share dual listed stocks (portfolio weights for similar risk levels).

10) Successful trading strategies between the H-share and A-share market are difficult, and would likely require considerable market knowledge as dual listed stocks move, on average, in the same direction only 65% of the days.



Data source: Bloomberg

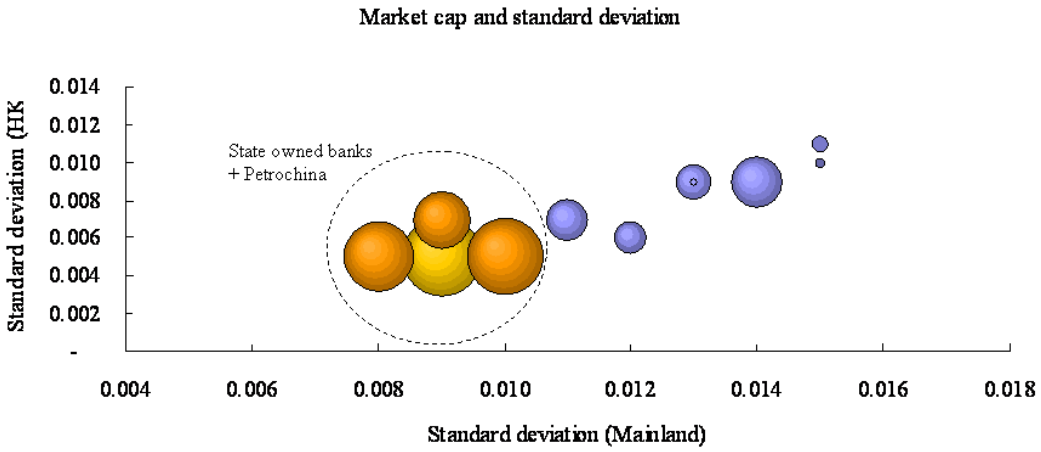
In the second half of the dissertation a principal component analysis was also performed. Including the following variables: Stock spreads, SHIBOR 3M5, CPI MOM, M2, buildings started, consumer confidence, effective policy rate, CPI, CPI food export price, import price and PMI. GDP, while clearly an important economic indicator was not included in the analysis because it is only released quarterly and this analysis was performed with monthly data. A principal component analysis was performed for all the dual listed companies. A four-factor model seems to be the adequate one. For instance in the case of China Construction Bank a four-factor model explained more than 89% of the variance. The first component of the four-factor model seems to be positively related to CPI, import and export prices and negatively related to M2. So it seems related to an indication of price changes less the impact of increases in money supply. The second factor is positively related to consumer confidence and PMI (representing perhaps an indication of how the Chinese middle class perceive the economic situation). The third component is strongly related to CPI MOM and strongly negatively related to new buildings started. Fear of inflation has been one of the major issues in recent years in China. The focus has shifted over the last couple of years to fears of a property bubble bursting. It is

interesting that this third component seems to be related to this concept.

The fourth component, and perhaps the most difficult to interpret, is positively related to consumer confidence and negatively related to PMI and SHIBOR 3M5. Consumer confidence is, obviously, a mainland China indicator (reflecting the feelings of the mainland population). Many mainland consumers are also retail (A-share) investors. PMI and SHIBOR are indicators followed by institutional investors (a considerable amount of retail investors also follow this index). If we take into account the larger proportion of institutional investors in the Hong Kong market (compared to the mainland market) then this fourth component could be related, at least to a certain extent, to the difference in perceptions between these two groups of investors.

A two state Markov-switching model (conceptually differentiating between a bull and a bear market) was used for the modeling. The results clearly divided companies into two groups: 1) the large state-owned banks and 2) the rest of companies.

Tianjin Capital, which is a typical Chinese corporate operating in the water recycling sector, was analyzed. The company had, as expected, a switching period of just a few days. The results for the large state-owned banks were rather different with all of them showing infinite (or almost infinite) expected duration indicating that such type of financial institution behaves in a more “stable” way than the average corporate. It should be also noted that midsize banks do not, according to the analysis performed, fit in the same category than the large state-owned banks. The recent liquidity squeeze in China was another indication that these two types of institutions behave in different ways. When liquidity in the interbank market decreases the share price of small and midsize banks (much more reliant on interbank funding) was considerable more volatile that the share price of the large state-owned banks (this is fully consistent with the results of our analysis).



Data source: Bloomberg

Ping An Insurance, a large Chinese insurance group, was also analyzed. Its expected regime duration periods are almost infinite (similarly to the large state-owned banks). Ping An is an interesting case because while it is not one of those banks it does have a massive equity stake in China Construction Bank (16.96%) and it is arguably considered too large to fail. China Life Insurance (a comparable insurance company), while having also relatively long expected duration times, it does not have the same behavior than Ping An i.e., it is not as close to the behavior of a large state-owned bank as Ping An is. The oil sector was also analyzed. It is interesting comparing oil companies with the banking sector because the share a few features such as size and systemic importance. Nevertheless, the results show that the Chinese oil companies behave more like normal corporates than like the large state-owned banks. One reason for this could be related to the fact that Chinese oil companies are, obviously, exposed to the fluctuations of oil prices (international market) while the banking sector, is to some degree, more insulated from the international markets.

An ARCH test of all the dual A-H listed companies was also performed. According to the results the vast majority of the companies (A-share, H-share and spreads) present ARCH effects. To the best of our knowledge there is no article in the literature analyzing every single dual listed (A-H) stock. A GARCH modeling of all the dual

listed stocks was also performed. According to the results of our analysis, the GARCH(1,1) is not inferior to the GARCH(2,1) model for the majority of the companies analyzed.

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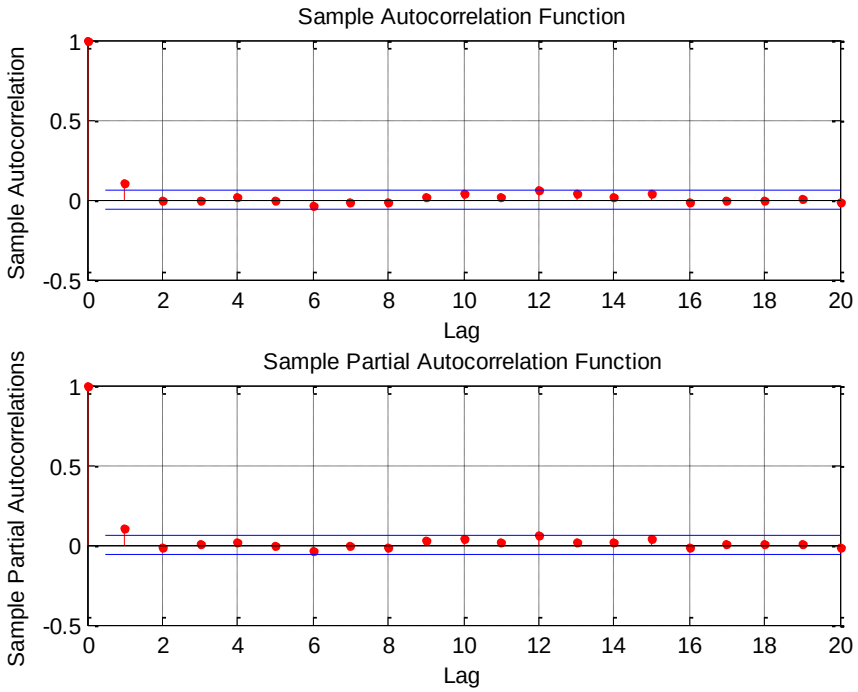


A case study in the airlines sector was also performed. Interestingly the results indicate that the fact that two companies are comparable (for instance two airlines with similar size, business model and operations) is not enough reason for assuming that a GARCH model that works well for one of those companies (for instance company A) will work properly for the comparable company (company B). China Eastern Airlines and China Southern Airlines were analyzed in a case study. These two companies are, arguably, good comparable. Both airlines are mainly domestic airlines catering for roughly the same type of average traveler. The other big player in the China market is Air China but this company is a bit different from the other two (that's why the comparison is between China Southern Airlines and China Eastern Airlines). According to the results a GARCH(1,1) model is, similar to most other

companies, a good model for China Southern (at least no worse than a GARCH(2,1) model). On the other hand, China Eastern seems to need a GARCH(2,1) model (according to the results a GARCH(2,1) model is a more appropriate one for this company than a GARCH(1,1) model).

Modeling of Dual Listed Chinese Stocks – Weak Arbitrage Environment
Resumen

Gerry Alfonso
Supervisor: Jesus Ruiz Andujar

Resumen

La importancia de los mercados de capitales chino ha aumentado drásticamente en los últimos años con el desarrollo de la economía china. China es ahora la segunda mayor economía del mundo y algunos analistas pronostican que podría superar, relativamente pronto, a los Estados Unidos. El mercado de capitales chino tiene algunas características muy interesantes; por ejemplo, China tiene dos mercados independientes, uno en Hong Kong y otro en la China continental. Hong Kong volvió a ser parte de China en 1997 y ha mantenido la mayor parte de su estructura financiera sin cambios desde entonces con una bolsa de valores independiente (Hong Kong Stock Exchange así como un, de facto, Banco Central (Hong Kong Monetary Authority).

Interesantemente, hay algunas empresas que cotizan en el mercado de la China continental (en el Shanghai o Shenzhen Stock Exchange) y en el mercado de Hong Kong (Hong Kong Stock Exchange).Por ejemplo, el Banco de China cotiza tanto en la China continental como en el mercado de Hong Kong. También cabe señalar que estos mercados son bastante diferentes. Hong Kong es un mercado abierto donde los inversores internacionales y nacionales tienen muy pocas restricciones a la compra/venta de acciones. Este mercado está dominado por los inversores institucionales internacionales. El mercado continental es un mercado cerrado. Los inversores internacionales no pueden acceder a este mercado. Hay una pequeña cantidad de programas piloto que permiten a los inversores institucionales extranjeros acceder a este mercado, tales como el QFII (Qualified Foreign Institutional Investor) y RQFII (RMB Qualified Foreign Institutional Investor), pero estos programas piloto siguen siendo bastante pequeños comparado con el tamaño del mercado total (menos del 2%).

Asimismo, los inversores locales de la China continental no pueden invertir en acciones en el extranjero (incluyendo Hong Kong). Hay un programa piloto llamado QDII (Qualified Domestic Institutional Investor) que permite a los inversores nacionales invertir en el extranjero pero, como en el caso anterior, este programa es muy pequeño con unos pocos productos QFII. El mercado continental es dominado por inversores individuales.

Las acciones en el mercado continental (normalmente llamadas A-share) y las acciones en Hong Kong de empresas chinas (típicamente llamadas H-share) aun cuando son de la misma empresa (dual-listed) no siempre se mueven en la misma dirección. Hay varios otros tipos de "acciones chinas" como las B-shares o las L-shares (empresas chinas que cotizan en Londres). Esta tesis doctoral se centra en compañías que cotizan en A-H. Las B-shares fueron diseñadas para permitir a los inversores extranjeros acceso al mercado de capitales continental y durante un largo periodo de tiempo los inversores nacionales no estaban autorizados a invertir en estas acciones. Las B-shares es un mercado que está desapareciendo. No ha habido una nueva oferta pública en más de una década y hay una cantidad muy limitada de acciones en este mercado. Muchos inversores creen que las B-shares serán absorbidas por el mercado de Hong Kong (H-share) y, de hecho, este proceso ha comenzado recientemente.

Muchos analistas sostienen que Hong Kong tiene un mejor gobierno corporativo así como una mejor ley de protección de los inversores que la China continental. La literatura académica en este sentido parece indicar que Hong Kong tiene un mejor (o al menos más occidentalizado) sistema de protección de los inversores. Si es así entonces poseer A-shares de una empresa cotizada no es estrictamente lo mismo que poseer H-shares de la

misma empresa al menos desde un punto de vista jurídico. Algunos artículos recientes parecen indicar que esta aparente disparidad entre la China continental y Hong Kong se ha reducido considerablemente en los últimos años.

Estas compañías que cotizan en estos dos mercados (A–H) pueden dividirse en dos tipos de empresas, los grandes bancos estatales (y otras empresas afines) y el resto de corporaciones que tienen un comportamiento substancialmente diferente. Un modelo Markov-switching fue utilizado para cuantificar esta diferencia de comportamiento. Este modelo muestra que los grandes bancos estatales tienen un periodo de duración estimada infinita, por lo que sería muy difícil para un inversor encontrar una oportunidad de arbitraje en este tipo de acciones.

Dado que las A-shares y H-shares de una empresa con doble cotización se mueven en la misma dirección (diaria) de promedio solo en 65% de los casos la búsqueda de oportunidades de inversión podría ser difícil y, probablemente, requiere considerable conocimiento del mercado. Un GARCH (P, Q) se utilizó para modelar la volatilidad de las acciones (A-shares, H-shares así como de las diferencias). Los resultados muestran que una GARCH (1,1) no es inferior a un modelo GARCH (2,1) para la mayoría de las empresas cotizadas. También se demuestra mediante el estudio de un caso particular (compañías aéreas) que no es posible concluir en general que las empresas similares, como China Southern Airlines y China Eastern Airlines, son necesariamente descritas adecuadamente por el mismo tipo de modelo (GARCH (1,1) o GARCH (2,1).

Es importante entender que hay diferentes factores técnicos, como horarios de apertura o diferentes días festivos que pueden afectar los precios en un mercado pero no en el otro. También hay otros eventos más exóticos tales como tifones que pueden, y hacen, detener la negociación en una bolsa y no en la otra. Tifones llegan a Hong Kong con relativa frecuencia. Por ejemplo, la negociación se detuvo debido a los tifones en Hong Kong durante el último par de años en varias ocasiones. Hong Kong tiene un sistema bien estructurado de alarmas y cierre (por decreto) de mercados cuando llegan tifones de cierta intensidad. Claramente este tipo de evento podría hacer que los inversores de Hong Kong no pudieran reaccionar a un evento de mercado mientras que los inversores continentales si pudieran (obviamente afectando la diferencia de precios). Otras cosas a considerar son las limitaciones acerca del short-selling. Short-selling es permitido para la mayoría de las acciones cotizadas en el mercado de Hong Kong. Los inversores extranjeros que acceden al mercado continental a través del programa de QFII o del RQFII no están autorizados a realizar short-selling. Esto genera una estrategia de arbitraje sumamente difícil. Muy recientemente (a principios de 2013) las autoridades chinas presentaron una iniciativa que permite a los inversores extranjeros usar Index Futures (en el índice CSI 300) a través del programa QFII. Inversores QFII son capaces de hacer un short-sell en el CSI 300 y así cubrir sus posiciones. Cabe señalar otras dos puntos importantes:

1. Short-sell, al nivel de acciones específicas (no del índice), sigue estando prohibido para los inversores extranjeros (QFII y RQFII) y
2. un short-sell en el índice CSI 300 solo se permite con fines de cubrir una posición (el reglamento actual no permite estrategias de arbitraje).

Los costes también son diferentes entre el mercado de Hong Kong y el mercado continental. Otro factor a tener en cuenta son las fuertes limitaciones en el mercado continental. Si el precio de la acción sube o baja más de un

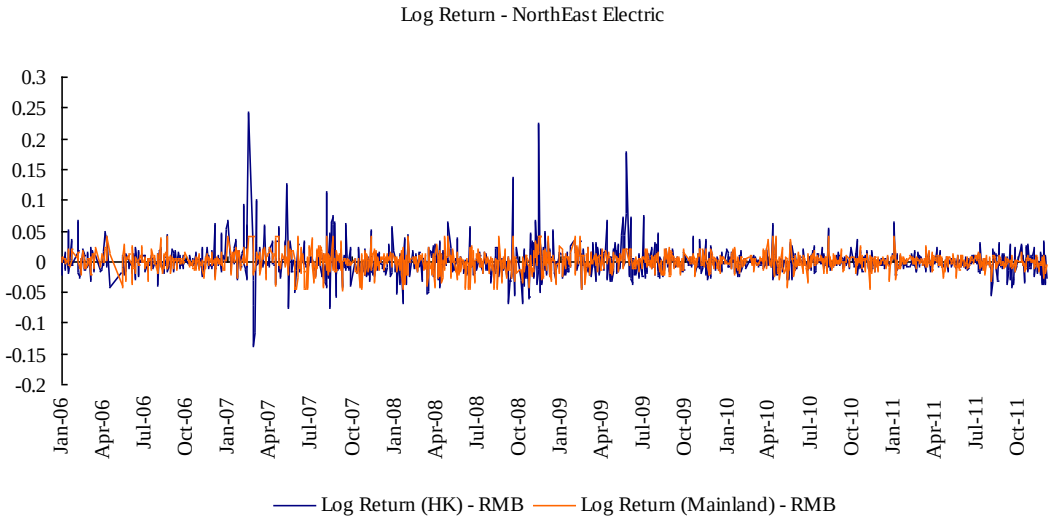
10% respecto del precio de cierre del día anterior la bolsa parará la cotización de esa acción. Esto se llama un “up/down limit”.

Este artículo identifica 21 puntos que pueden potencialmente afectar a la diferencia en el precio de acciones cotizadas en los dos mercados (A-H)

1. Diferentes sistemas legales
2. Distintos tipos de inversores (institucionales vs individuales)
3. Liquidez
4. Regulación
5. Costes
6. Horarios
7. Días Festivos
8. Límites (up/down limit)
9. Short-selling
10. Efectos de divisas
11. La intervención de los bancos centrales
12. Idioma (mandarín y cantones) y su impacto en la información
13. El acceso y la velocidad para acceder a la información
14. Dividendos
15. Las expectativas de inflación
16. Diferentes perspectivas económicas del inversor
17. Nivel de educación financiera de los inversores (individuales)
18. Diferentes estilos predominantes de negociación
19. Horizontes de inversión
20. Como se calcula el precio de cierre
21. Settlement

Otro punto importante en esta tesis es que la volatilidad en el mercado continental no es necesariamente mayor que en el mercado de Hong Kong, al

menos durante el período analizado. Comúnmente se asume que la volatilidad en el mercado de China continental es mayor, ya que hay más inversores minoristas (heard behaviour). Los resultados indican claramente que la volatilidad para el período de 12 meses analizados no fue mayor en el mercado continental que en el mercado de Hong Kong. Cabe señalar que los resultados no contradicen la idea de que en el mercado continental hay “heard behaviour”, solo se indica que no hemos llegado a la conclusión de que, dado cualquier periodo prolongado de tiempo (por ejemplo, un año), se puede suponer que el mercado H-share tendrá menos volatilidad que el mercado A-share. Técnicas de escalamiento multidimensional fueron utilizadas como una herramienta de *preprocesado*. El principal objetivo de este MDS fue tener una idea más clara sobre el agrupamiento de los datos así como ser capaz de visualizar (de una manera comprensible) la gran cantidad de datos. Aparte de unas pocas excepciones, la mayor parte de las empresas tienden a estar fuertemente agrupadas.



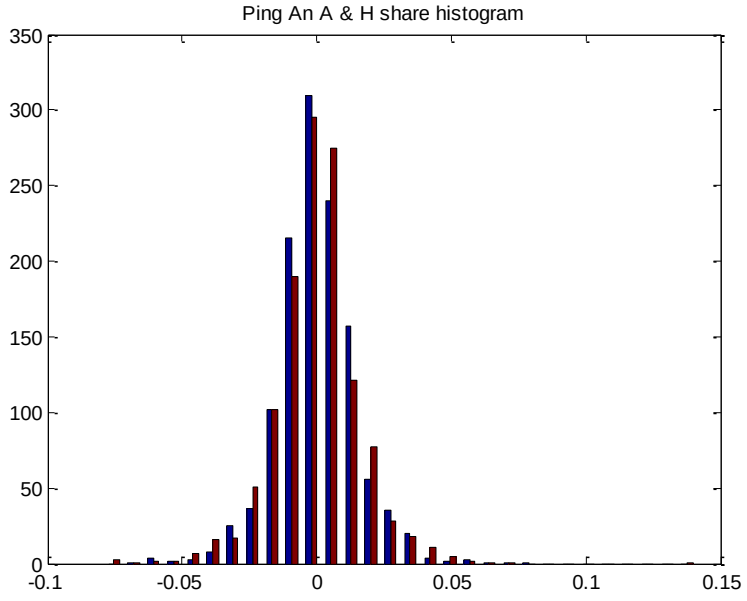
Datos: Bloomberg

Algunos de los principales resultados en la primera parte de la tesis son:

1. Los cambios en el precio de las acciones chinas no están normalmente distribuidas. Este parece ser el caso para la inmensa mayoría de las empresas que cotizan en China (no solo para las que cotizan en China y Hong Kong).
2. No existe una fuerte correlación lineal entre las A-shares y las H-shares de la misma compañía. Claramente, esto no implica que no exista ningún tipo de relación entre acciones, solo significa que esta relación no es lineal.
3. No hay ninguna diferencia estadísticamente significativa entre invertir en las A-shares y las H-shares de la misma empresa si la inversión se mantiene por un periodo relativamente largo (12 meses).
4. Mientras que las A-shares tiende a ser más volátiles que las H-shares (misma empresa) esta relación no es siempre cierta para un período de tiempo medianamente largo (12 meses).
5. La introducción del programa QFII no tuvo ningún efecto estadísticamente significativo en el comportamiento de dos empresas que cotizan en bolsa.
6. El mercado de A-shares no siempre reacciona de una manera más volátil a “eventos" que las H-shares (misma compañía)
7. El análisis parece diferenciar entre dos tipos de acciones (con cotización en los dos mercados). El primer tipo coincide, básicamente, con los grandes bancos estatales chinos (y algunas empresas afines a estos bancos) y el segundo tipo son todas las otras compañías.
8. Un modelo de factores fue utilizado para analizar las empresas con cotización en los dos mercados. Se incluyeron algunos de los principales indicadores económicos, tales como IPC, IPC (alimentos), Shibor, M2, la producción bruta de la industria, la confianza de los consumidores, “policy rate”, precio de exportaciones, precio de

importaciones y el PMI. Cuatro componentes parecen ser suficientes para modelar estas acciones.

9. Las fronteras eficientes fueron calculados para las A-shares (cartera) y las de H-shares (cartera).La fronteras eficientes son bastantes diferentes en el caso de A-shares and H-shares (los pesos en las carteras para niveles de riesgo comparables).
10. Es claramente difícil invertir con éxito basándose en los cambios de precio de las acciones (A-H) y probablemente requiere considerable conocimiento del mercado debido a que la A-share y la H-share para la misma compañía se mueven en la misma dirección (de media) solo en el 65% de los días.



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En la segunda mitad de la tesis doctoral se realiza un análisis de componentes principales. Incluyendo las siguientes variables: diferencias de precios de las acciones, Shibor 3m5, IPC (mensual), M2, número de nuevos

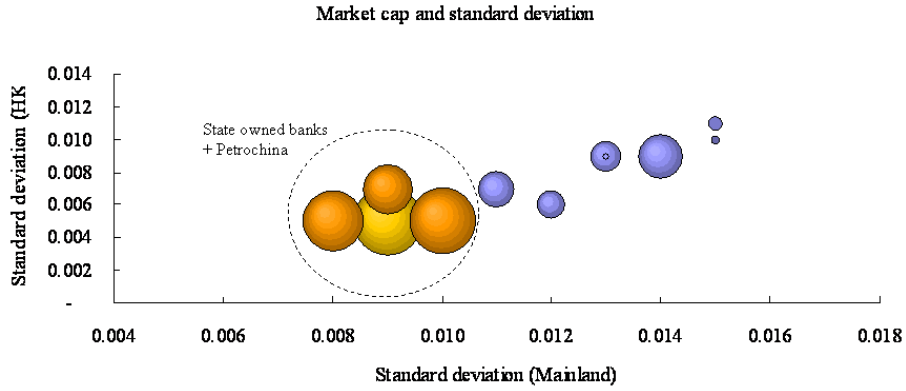
edificios construidos, confianza de los consumidores, policy rate, IPC, IPC (alimentos) precio de exportaciones, precio de importaciones y PMI. El PIB, aunque es claramente un importante indicador económico no se incluyó en el análisis porque solo es publicado trimestralmente y este análisis fue realizado con datos mensuales. Se realizó un análisis de componentes principales para todas las compañías que cotizan en los dos mercados. Un modelo de cuatro factores parece ser el adecuado .Por ejemplo, en el caso de "China Construction Bank" un modelo de cuatro factores explicó más del 89% de la varianza. El primer componente del modelo parece estar positivamente relacionado con el IPC, los precios de importación y exportación y negativamente con el M2. De modo que parece estar relacionado con los cambios de precios menos el impacto de los cambios en M2. El segundo factor está relacionado positivamente con la confianza de los consumidores y PMI (que representa quizás una indicación de cómo la clase media china percibe la situación económica). El tercer componente está fuertemente relacionados con el IPC (mensual) y negativamente relacionado con la construcción de nuevo edificios. El temor de la inflación ha sido uno de los principales problemas en los últimos años en China. El enfoque ha cambiado durante el último par de años con inversores, ahora más preocupados con la posibilidad de una burbuja inmobiliaria. Es interesante que este tercer componente parece estar relacionado con este concepto.

El cuarto componente, y tal vez el más difícil de interpretar, está positivamente relacionado con la confianza de los consumidores y negativamente relacionado con el PMI y Shibor 3m5. La confianza de los consumidores es, obviamente, un indicador que refleja la percepción de la economía de los consumidores de la China continental. Muchos de los consumidores continentales también son inversores (inversores individuales). PMI y Shibor son indicadores seguidos por inversores institucionales (una cantidad

considerable de inversores minoristas también sigue este índice). Si tomamos en cuenta la mayor proporción de los inversores institucionales en el mercado de Hong Kong (frente al mercado continental) entonces este cuarto componente podría estar relacionado, al menos en cierta medida, a la diferencia en la percepción entre estos dos grupos de inversionistas.

Un modelo Markov-switching de dos estados (representando conceptualmente la diferencia entre un mercado al alta y un mercado a la baja) fue utilizado para el modelado. Los resultados claramente sugieren que hay dos tipos de acciones: 1) los grandes bancos estatales (y empresas afines) y 2) el resto de las empresas.

Todas las empresas fueron analizadas. Un ejemplo es Tianjin Capital, que es una empresa típica china que opera en el sector de reciclaje de agua. Se obtuvo un periodo esperado de cambio de sólo unos días. Los resultados para los grandes bancos estatales son bastante diferentes con todos ellos, mostrando periodos infinitos (o casi infinitos) de duración prevista, indicando que este tipo de institución financiera se comporta de manera más "estable" que las otras empresas. También cabe señalar que los bancos de tamaño medio, según el análisis realizado, no encajan en la misma categoría que los grandes bancos estatales. La reciente contracción de la liquidez en China es otra indicación de que estos dos tipos de instituciones se comportan de manera diferente. Cuando la liquidez en el mercado interbancario disminuye el precio de la acción de pequeños y medianos bancos (mucho más dependientes de la financiación interbancaria) son mucho más volátiles que el precio de las acciones de los grandes bancos estatales (esto es plenamente coherente con los resultados de nuestro análisis).



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La compañía de seguros Ping An (un gran grupo de seguros Chino), también fue analizada. Su régimen se prevé períodos de duración casi infinita (de forma similar a los grandes bancos estatales). Ping An es un caso interesante porque, aunque no es uno de esos bancos, tiene unas inversiones muy significativas en acciones de China Construction Bank (16,96%). Para China Life Insurance (una compañía de seguros comparable), mientras que también se obtiene una relativamente larga duración prevista, no tiene el mismo comportamiento que Ping An, es decir, no se asemeja en este sentido a los grandes bancos estatales chinos. El sector petroquímico también fue analizado. Es interesante comparar las empresas petroquímicas con el sector bancario porque comparten algunas características tales como el tamaño y, en cierta medida, la importancia sistémica. Sin embargo, los resultados muestran que las empresas petroleras chinas se comportan de una manera más cercana a corporaciones normales que a los grandes bancos estatales chinos. Una posible razón para esto podría estar relacionada con el hecho de que las empresas petroleras chinas están, obviamente, expuestas a las fluctuaciones de los precios del petróleo (mercado internacional), mientras que el sector bancario está relativamente más aislado de los mercados internacionales.

Se hizo un Arch Test para todas las empresas que cotizan en los mercados A-H. Los resultados indican que la gran mayoría de las empresas (A-share, H-share y las diferencias) tienen efectos Arch. No se encontró en la literatura ningún artículo analizando las diferencias (A-H) al nivel de la empresa individual. También se hizo un modelado “GARCH” de todas las empresas (A-H). De acuerdo a los resultados de nuestro análisis, el modelo GARCH (1,1) no es inferior al modelo GARCH (2,1) para la gran mayoría de las empresas analizadas.

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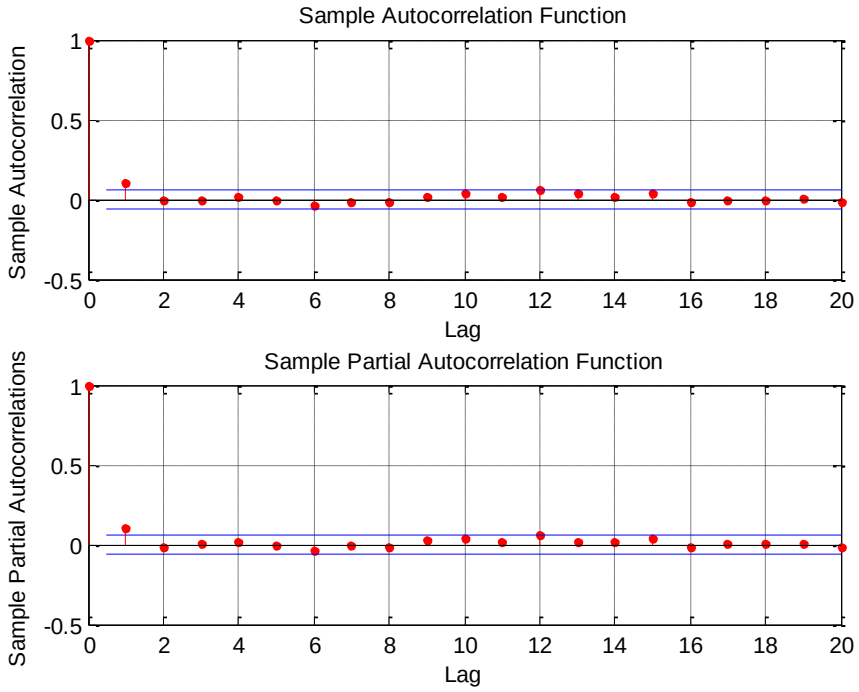

Se analizó en detalle el caso particular de las líneas aéreas. Los resultados indican que el hecho de que dos empresas sean comparables (por ejemplo, dos compañías con similar tamaño, modelo de negocio y operaciones) no es razón suficiente para asumir que un modelo GARCH que funciona bien para una de las empresas (por ejemplo, la empresa A)

funcionará correctamente para la otra compañía (empresa B). China Eastern Airlines y China Southern Airlines fueron analizadas. Estas dos empresas son aerolíneas comparables. Ambas, son las principales compañías aéreas nacionales y sus clientes típicos tienen un perfil similar. La otra gran compañía en este sector es Air China pero esta empresa es considerablemente diferente a los otras dos. Según los resultados obtenidos, un modelo GARCH (1,1) es adecuado para China Southern (no se mejora con un modelo GARCH (2,1)). Por otro lado, China Eastern, parece necesitar un modelo GARCH (2,1).